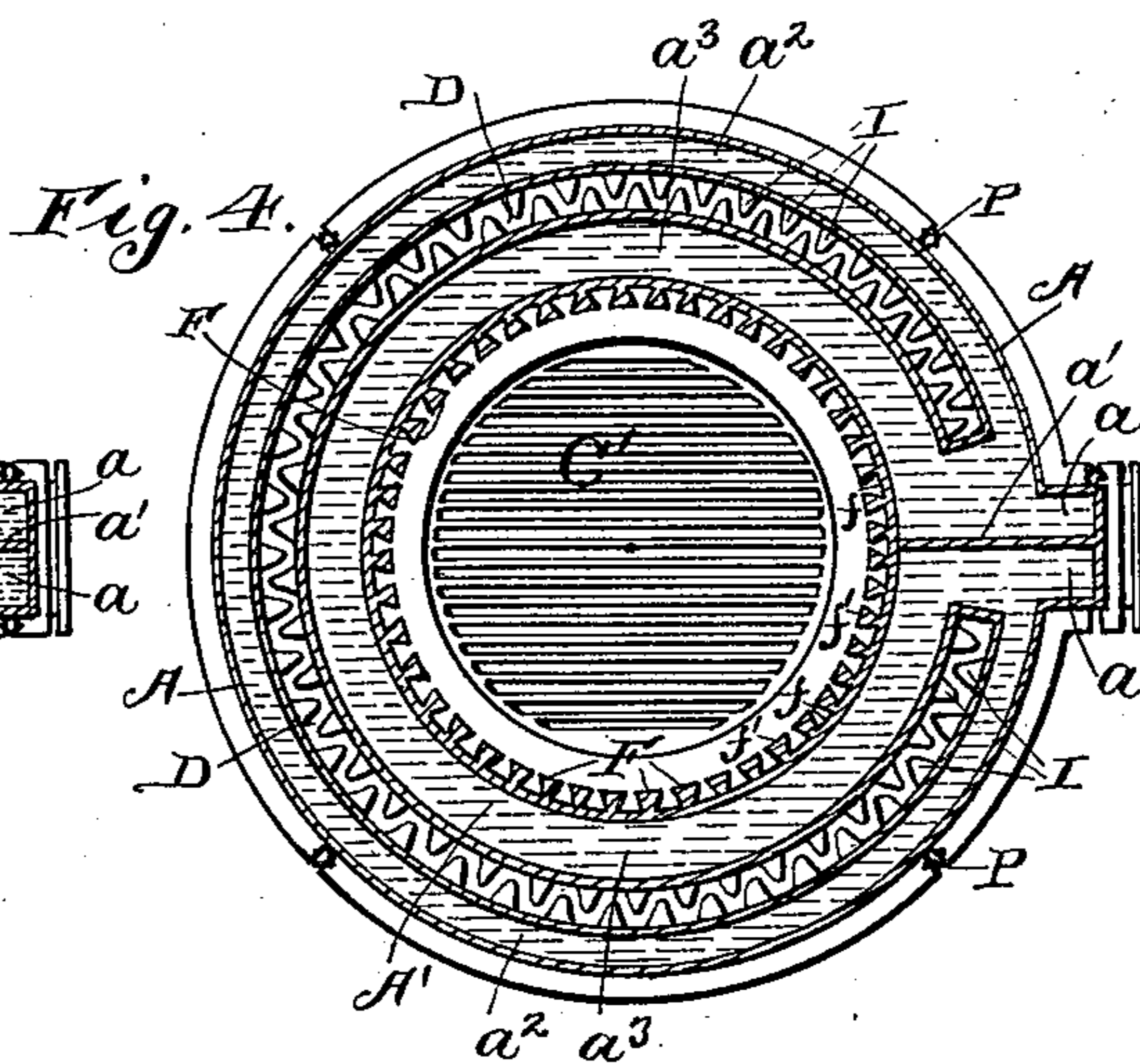
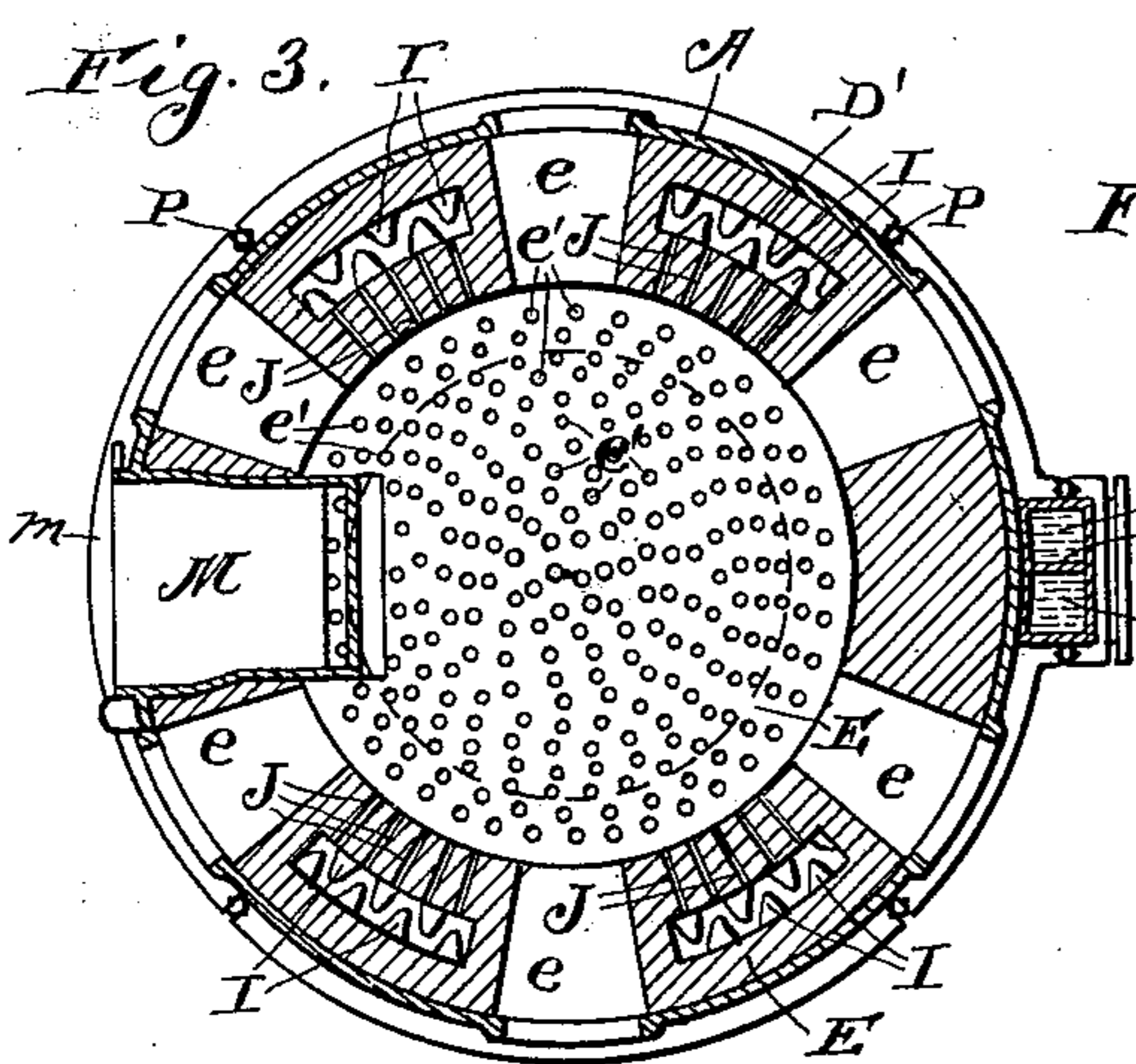
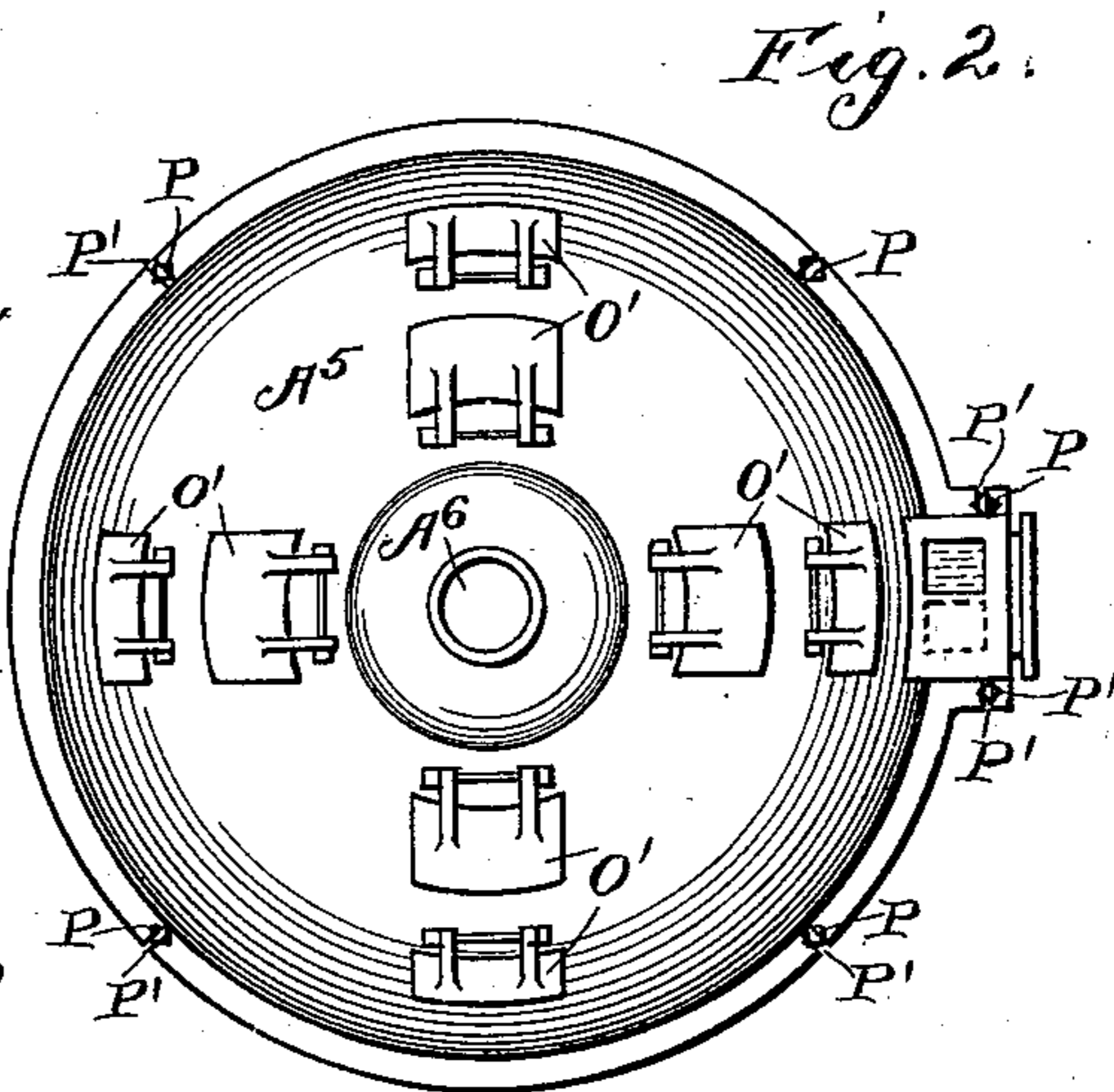
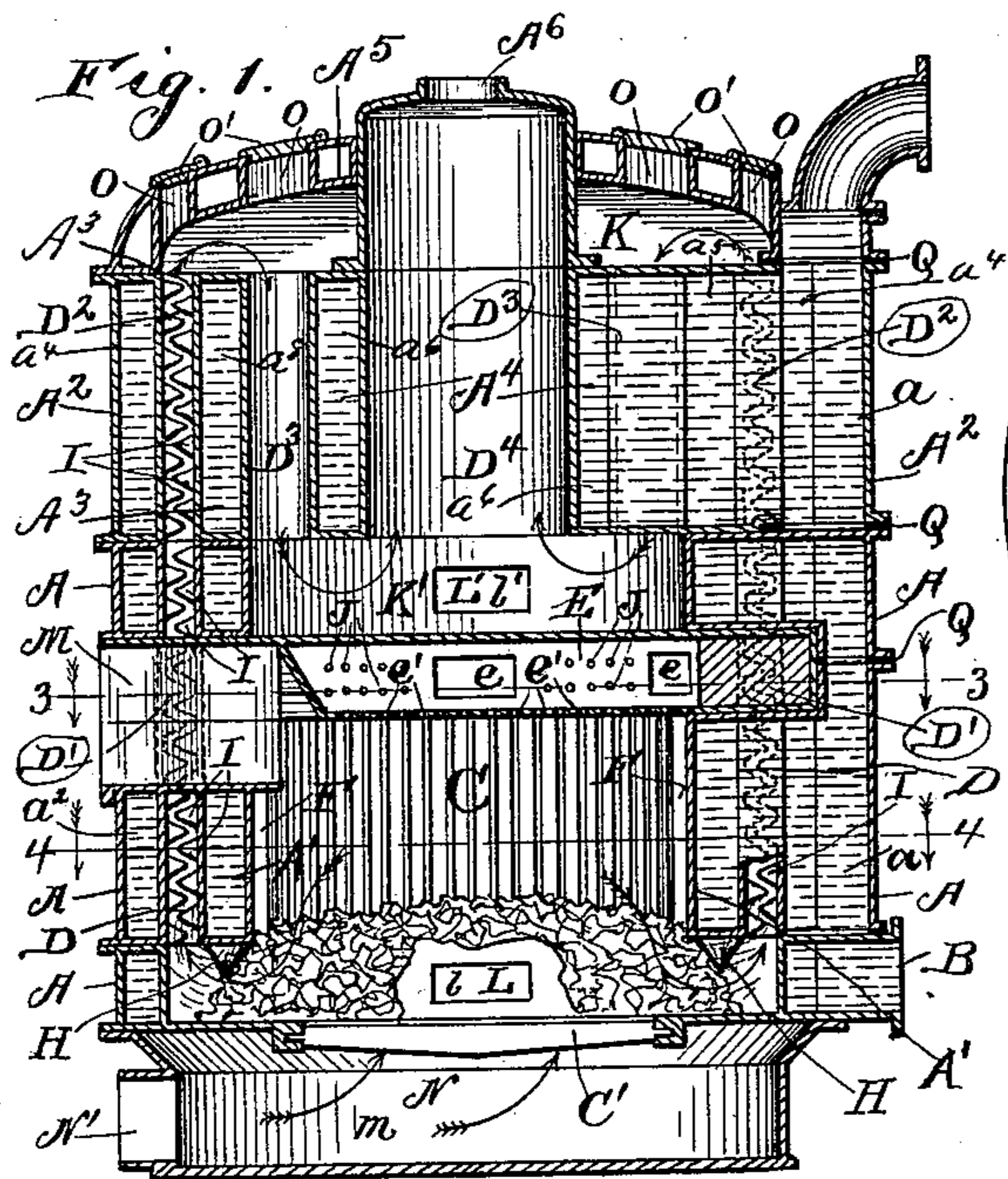


(No Model.)

R. H. LAIRD.
HOT WATER HEATER.

No. 560,268.

Patented May 19, 1896.



Witnesses:

R. J. Jackson.

Flora L. Brown.

Inventor:

Robert H. Laird.

By Charles Turner Brown, Atty.

UNITED STATES PATENT OFFICE.

ROBERT H. LAIRD, OF BUFFALO, NEW YORK.

HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 560,268, dated May 19, 1896.

Application filed December 10, 1895. Serial No. 571,616. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. LAIRD, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Hot - Water Heaters, of which the following, when taken in connection with the drawings accompanying and forming a part hereof, is a full and complete specification, sufficient to enable those skilled in the art to which it pertains to understand and make the same.

My invention relates to the class and kind of hot-water heaters whereby water is heated and used, primarily, for warming buildings, the heated water extending from the hot-water heater through a system of pipes and radiators back to the hot-water heater and in a cooled condition, having parted with its heat or the greater part thereof by radiation and for the purpose designated—that is, for the warming of buildings; and it is the object of this invention to obtain a hot-water heater wherein perfect combustion of the fuel employed shall be obtained, and the whole or a very high percentage of the resulting heat shall be retained in and by the water passing through the device embodying the invention and so utilized.

A further object is to obtain a hot-water heater which will require but little care and attention when in use, and which shall be easy of manipulation and safe.

A further object of my invention is to obtain a hot-water heater simple in construction and not expensive, easily put in operative condition by persons not specially skilled therein, and which shall be durable. It is to be understood that water heated by a hot-water heater embodying my invention is well adapted for all the uses to which any and all water of like temperature is adapted, and that the heat, if any, remaining in the products of the combustion of the fuel consumed therein, as such products pass from the heater, can be put to any suitable use desired.

In the drawings referred to as forming a part of this specification, Figure 1 is a vertical sectional view of a hot-water heater embodying my invention; Fig. 2, a top plan view thereof; Fig. 3, a horizontal sectional view on line 3 3 of Fig. 1, viewed in the di-

rection indicated by the arrows; and Fig. 4, a horizontal sectional view on line 4 4 of Fig. 1, viewed in the direction indicated by the arrows.

A reference-letter applied to indicate a given part is used to designate such part throughout the several figures of the drawings wherever the same appears.

The boiler part of the hot-water heater embodying my invention is built up of hollow metal rings A A' and A² A³ A⁴, preferably of cast-iron, such rings having the extensions a a, respectively. The extensions a a have therein the vertical partitions a' a', respectively, whereby when the hollow metal rings are placed one above the other, as illustrated in Fig. 1 of the drawings, water may extend from the inlet B in the extension a of the adjacent and lower hollow ring, from thence upward into the like extension a of the adjacent and next higher ring. Such water going out of any given hollow ring may leave it on the opposite side of the partition a' in the extension a thereof from which it enters such ring.

In order that the products of combustion in the fire-pot or fire-chamber C may extend between walls backed by water, the hollow rings A A' and A² A³ A⁴, respectively, are placed as illustrated in Fig. 1, a² a² being the water-ways or water-receptacles of the hollow rings A A' and D the passage-way therethrough for the products of combustion, and a⁴ a⁵ a⁶ the water-ways or water-receptacles of the hollow rings A² A³ A⁴ and D² D³ D⁴ the passage-ways therethrough, respectively, for the products of combustion. The products of combustion in passing through such passage-ways D D² D³ D⁴ and passage-way D', hereinafter described as connecting passage-way D with passage-way D², part with their heat, or with a portion thereof, to the walls of the water-receptacles adjacent thereto and forming the passage-ways, and by conduction raise the temperature of the water contained in such hollow rings.

The combustion-chamber C has an updraft through the grate-bars C' from the ash-chamber, and also a downdraft from above the mass of burning fuel therein. To obtain the required supply of air for the downdraft, and

that such air may be heated, I interpose between the hollow rings surrounding the fire-pot or fire-chamber C and the hollow rings surrounding the respective passage-ways D² D³ D⁴ the air-supply chamber E, such air-supply chamber being thereby located directly above the fire pot or chamber C. Through the side walls of the air-supply chamber E there are placed air-inlet passage-ways *e e*, and to connect the passage-way D, for the product of combustion, with the passage-way D², I construct the vertical passage-ways D' D' D' in the side walls of the chamber E, between the inlet passage-ways *e e*. The exact number and comparative size of the air-inlet passage-ways *e e* and the passage-ways D' D' D' for the products of combustion are not necessarily as illustrated in the drawings.

e' e' e' are perforations in the bottom of the hot-air chamber E, through which air supplied to the fire-pot or fire-chamber C passes from hot-air chamber E.

F F are grooves formed on the inner face of the hollow ring forming the fire-pot or fire-chamber C, such grooves forming ducts or conduits whereby air is supplied to the body of the burning mass in the fire-pot when the fuel therein extends above the lower edge of the hollow ring A². In constructing these grooves the back *f f* thereof, respectively, is made wider than the front opening *f' f'* thereof, to prevent such groove becoming clogged by pieces or lumps of coal. It will be observed that hollow circular ring A' does not extend to grate-bars C' and that the products of combustion extending downward into and through the mass of burning fuel in fire-pot C can escape therefrom underneath the hollow ring A' and from thence pass upward in passage-way D.

H H are projections or fingers on the lower edge of the hollow ring A', between which the products of combustion pass in leaving the fire-pot C. The products of combustion from fire-pot C, passing up the passage-way D, part with a portion of their heat to the walls of the hollow rings A A', and to increase the surface with which such products of combustion will come in contact the projections I I are placed on the walls of such hollow rings in the passage-way D, and like projections extend from the hollow rings A² A³ into passage-ways D² D³, respectively. I find in practice that even with these projections I I such products of combustion are in a highly-heated condition when passing through the passage-ways D' D' and that by the addition or supplying thereto at such point of heated air from the hot-air chamber E additional combustion is obtained, and I therefore construct the passage-ways J J from the hot-air chamber E to the passage-ways D' D', respectively. The products of combustion extending through passage-ways D' D', together with the air admitted thereto through passage-ways J J, respectively, extend through

passage-way D² to the space K underneath the dome A⁵, and from thence pass downward in passage-way D³, between hollow rings A³ A⁴, to space K' above the hot-air chamber E and from thence upward in passage-way D⁴, and are discharged from the hot-water heater through opening A⁶.

To enable one to readily clean the fire-chamber or fire-pot C, opening L, closed by door *l*, is placed therein, extending through the hollow rings A and under A'.

L' is an opening closed by door *l'*, extending into the space K' to enable such space or chamber to be cleaned. Fuel is fed to the fire-chamber or fire-pot C through opening M, such opening being closed by door *m*. (See Fig. 3.) To obtain access to ash-pit N, opening N' is made in the wall thereof, and to obtain access to passage-ways D² D³, respectively, the openings O O are made through the dome A⁵, such openings being closed, respectively, by doors O' O'. The several hollow rings are secured together by bolts P P, inserted in slots P' P', respectively.

Q Q is packing interposed between the extensions *a a*, respectively, of the hollow rings to render the same water-tight.

The operation of the hot-water heater embodying my invention is extremely simple, and may be briefly stated to be as follows: Fuel being introduced into fire-chamber or fire-pot C (through opening M) and ignited, the products of combustion obtained thereby will pass through passage-ways D, D', D², D³, and D⁴, respectively, and to a suitable chimney. In such course of such products the water contained in the several water-receptacles described will be raised in temperature thereby, such products of combustion being correspondingly cooled. As the products of combustion extend through the passage-ways D' D' and additional air is supplied thereto, additional combustion will occur in such passage-ways D' D' and in passage-ways D³ D⁴. The grooves F F allow air entering the fire-chamber C from the hot-air chamber E to extend well into the mass of burning fuel in the fire-chamber along the edges of such burning fuel, and the projections in the passage-ways D² D³ present great surface to the heated products of combustion, as well as a considerable mass of material to be heated thereby. I prefer to construct the walls of the hot-air chamber E, as well as the top and bottom walls and the side walls, of fire-brick or fire-clay, such material being well adapted to withstand the heat of the fire-chamber, as well as to become itself highly heated and thereby adapted to impart a high degree of heat to the air contained in such hot-air chamber.

I claim—

1. The combination of a fuel-pot, a hot-air chamber over the fuel-pot, passage-ways from the chamber to the outside thereof and passage-ways from such chamber to the fuel-pot, means for supplying air to the fuel-pot

through the grate-bars thereof, water-receptacles around the fuel-pot A below the hot-air chamber, means for discharging below the adjacent water-receptacle surrounding it the products obtained in such fuel-pot, passage-ways through the water-receptacles for the products so discharged from the fuel-pot, and passage-ways communicating with the last-named passage-ways and with the chimney through the hot-air chamber; substantially as described.

2. The combination of a fuel-pot, a hot-air chamber over the fuel-pot, passage-ways from the chamber to the outside thereof and passage-ways from such chamber to the fuel-pot, means for supplying air to the fuel-pot through the grate-bars thereof, water-receptacles around the fire-pot below the hot-air chamber, passage-ways through the water-receptacles for the products obtained in the fuel-pot, and passage-ways communicating with the last-named passage-ways and with the chimney through the hot-air chamber, with passage-ways from the hot-air chamber to the passage-ways extending therethrough; substantially as described.

3. The combination of a fuel-pot, a hot-air chamber over the fuel-pot, passage-ways from the hot-air chamber to the outside thereof and passage-ways from such hot-air chamber to the fuel-pot, means for supplying air to the fuel-pot through the grate-bars thereof, water-receptacles around the fire-pot below the hot-air chamber, and receptacles for water above such hot-air chamber, passage-ways through the water-receptacles for the products obtained in the fuel-pot, the passage-ways through the water-receptacles above the hot-air chamber communicating with the chimney and passage-ways through the hot-air chamber connecting the passage-ways through the water-receptacles, below the hot-air chamber with the passage-ways through the water-receptacles above such hot-air chamber; substantially as described.

4. The combination of a fuel-pot, a hot-air chamber over the fuel-pot, passage-ways from the hot-air chamber to the outside thereof and passage-ways from such hot-air chamber to the fuel-pot, means for supplying air to the fuel-pot through the grate-bars thereof, water-receptacles around the fire-pot below the hot-air chamber, and receptacles for water above such hot-air chamber, passage-ways through the water-receptacles for the products obtained in the fuel-pot, the passage-ways through the water-receptacles above the hot-air chamber communicating with the chimney, and passage-ways through the hot-air chamber connecting the passage-ways through the water-receptacles below the hot-air chamber with the passage-ways through the water-receptacles above such hot-air chamber; with passage-ways from the hot-air chamber to such passage-ways extending therethrough; substantially as described.

5. The combination of a fuel-pot, a hot-air chamber over the fuel-pot, means for supplying air to the hot-air chamber, passage-ways from the hot-air chamber to the fuel-pot above the fuel therein, means for supplying air to the fuel in the fuel-pot through the grate thereof and means for discharging the products obtained in the fuel-pot midway of the burning fuel; whereby the air coming through the grate-bars and through the passage-ways from the hot-air chamber extends through the burning fuel.

6. The combination of a fuel-pot, with vertical grooves larger at the back thereof than at the open face in the wall of the fuel-pot, a hot-air chamber over the fuel-pot, means for supplying air to the hot-air chamber, passage-ways from the hot-air chamber to the fuel-pot above the fuel therein, means for supplying air to the fuel in the fuel-pot through the grate thereof and means for discharging the products obtained in the fuel-pot midway of the burning fuel; whereby the air coming through the grate-bars and through the passage-ways from the hot-air chamber extends through the burning fuel.

7. In a hot-water heater, a fuel-pot, a hot-air chamber over the fuel-pot, means for supplying air to the hot-air chamber, passage-ways from the hot-air chamber to the fuel-pot above the fuel therein, means for supplying air to the fuel in the fuel-pot through the grate thereof, means for discharging the products obtained in the fuel-pot midway of the burning fuel, and means for supplying additional air from the hot-air chamber to the passage-ways from the fuel-pot, whereby the air coming through the grate-bars and through the passage-ways from the hot-air chamber extends through the burning fuel, and additional and hot air is supplied to the products obtained after such products have left such fuel-pot; substantially as described.

8. In a hot-water heater, a fuel-pot, with vertical grooves larger at the back thereof than at the open face in the wall of the fuel-pot, a hot-air chamber over the fuel-pot, means for supplying air to the hot-air chamber, passage-ways from the hot-air chamber to the fuel-pot above the fuel therein, means for supplying air to the fuel in the fuel-pot through the grate thereof and means for discharging the products obtained in the fuel-pot midway of the burning fuel, and means for supplying additional air from the hot-air chamber to the passage-ways from the fuel-pot, whereby the air coming through the grate-bars and through the passage-ways from the hot-air chamber extends through the burning fuel, and additional and hot air is supplied to the products obtained in the fuel-pot after such products have left such fuel-pot; substantially as described.

9. A hot-air chamber consisting of a fire-clay disk, a second fire-clay disk and a fire-clay ring, with fire-clay pipes extending through

the disks and chamber, with perforations through the bottom disk; substantially as described.

10. A hot-air chamber consisting of a fire-clay disk, a second fire-clay disk and a fire-clay ring, with fire-clay pipes extending through the disks and chamber, with perforations

through the bottom disk, and through the pipes from the chamber; substantially as described.

ROBERT H. LAIRD.

In presence of—

W. H. LAIRD,

CHARLES TURNER BROWN.