

(No Model.)

E. F. WARD.  
HEATING APPARATUS.

No. 348,602.

Patented Sept. 7, 1886.

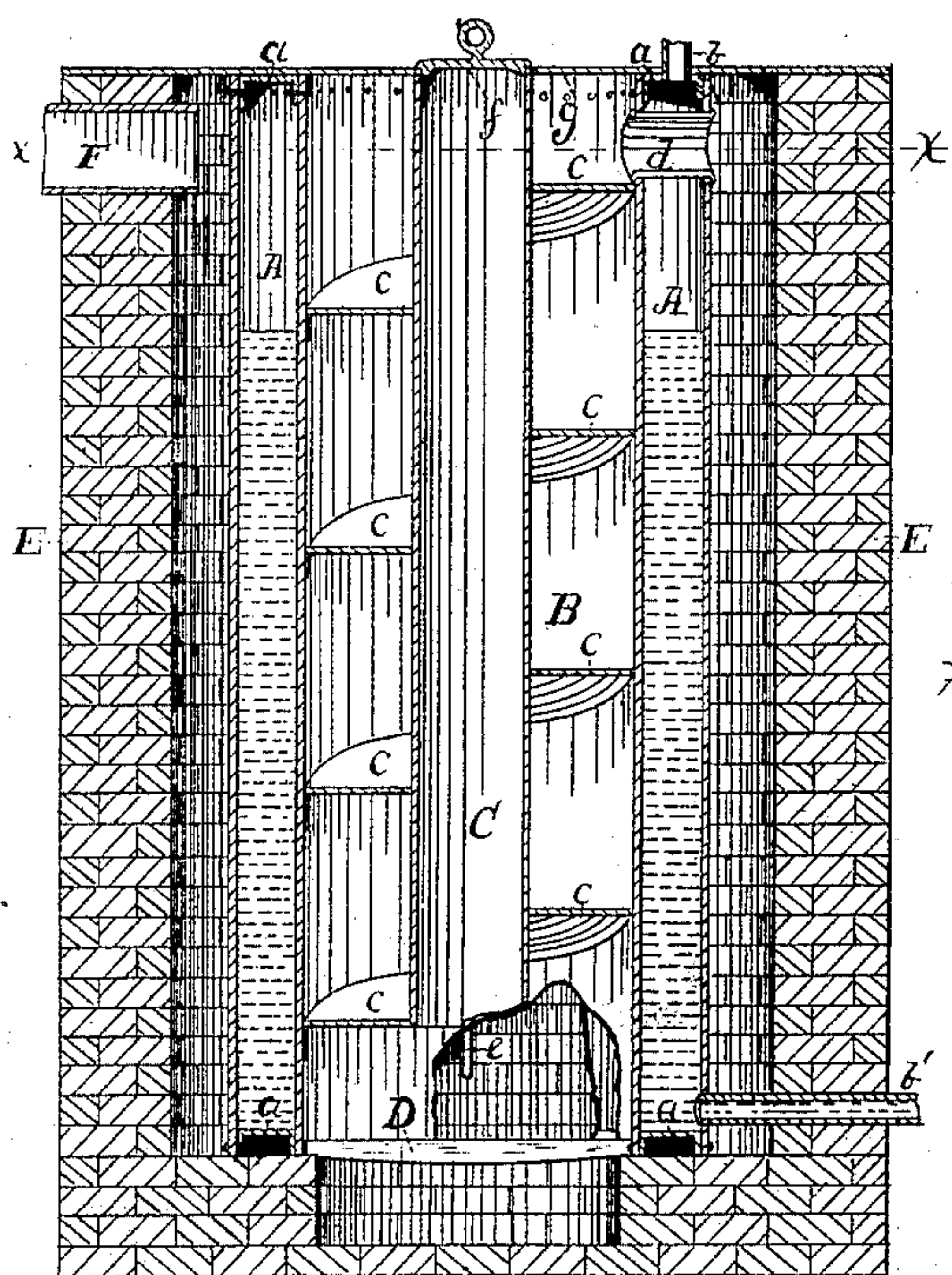


Fig. 1

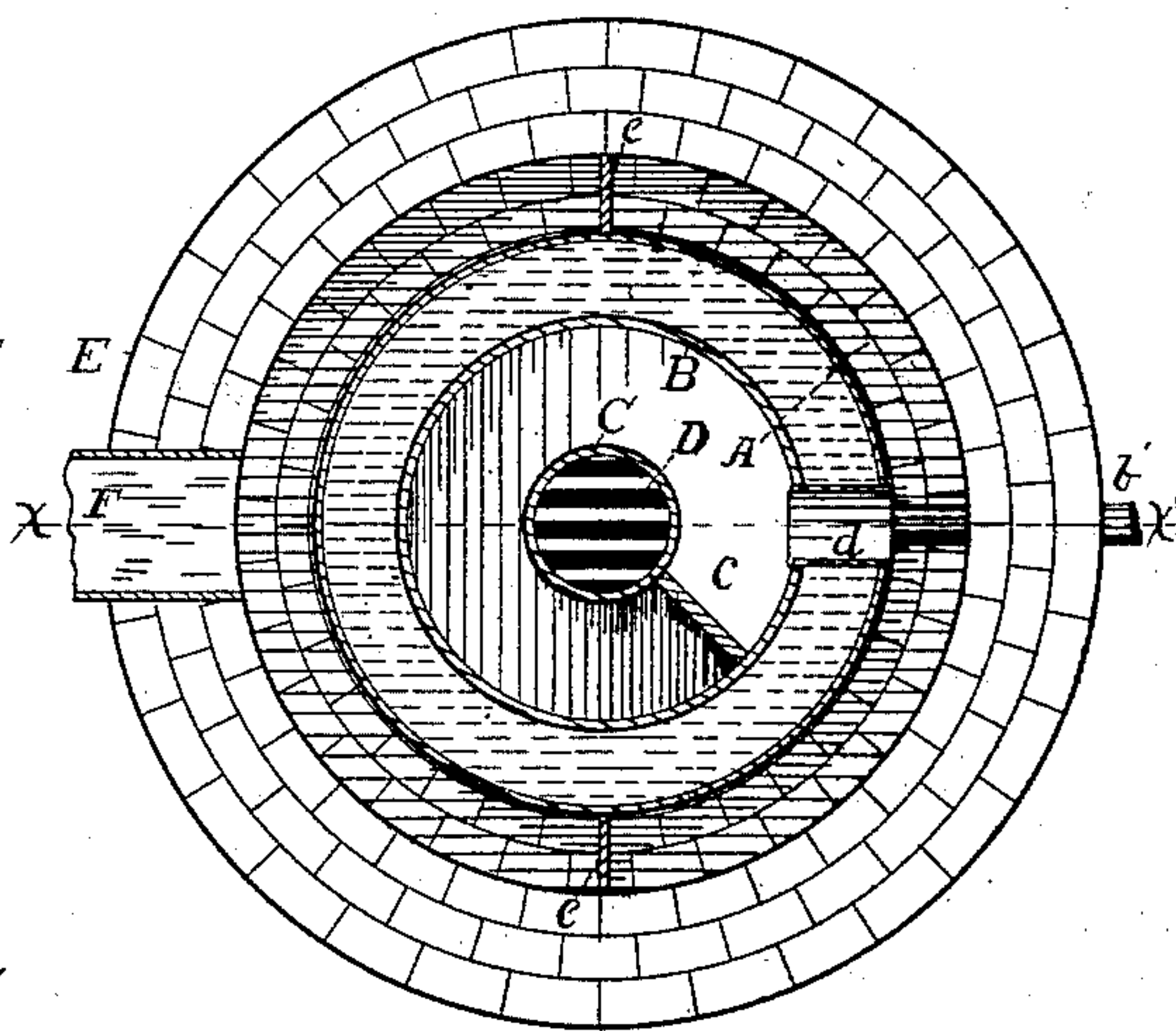


Fig. 2.

Witnesses

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# UNITED STATES PATENT OFFICE.

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## HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 348,602, dated September 7, 1886.

Application filed February 10, 1886. Serial No. 191,512. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD F. WARD, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented a new and useful Heating Apparatus, of which the following is a specification.

My invention relates to devices which are designed to heat the rooms in buildings by means of hot water or steam, which is caused to circulate through a heater or boiler and suitable radiators connected to the boiler by pipes.

The objects of my invention are to utilize as much as possible the heat from the fuel; to make a cheap, strong, and efficient boiler, and to provide means whereby a considerable quantity of fuel can be placed in the apparatus at one time and gradually consumed, thus avoiding frequent firing. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of the device on the line *xx* of Fig. 2, and Fig. 2 is a horizontal section on the line *xx* of Fig. 1.

Like letters refer to like parts in each.

A is an upright cylindrical boiler having a single large flue, B, which is secured to shell A by annular heads *aa*. In the center of the flue B is situated a tube or magazine, C, to contain the supply of fuel, the lower end of which terminates a short distance above the grate D, which is at the lower end of the flue B.

*c* is a spiral diaphragm which converts the space between the magazine C and the flue B into a spiral passage, through which the products of combustion pass from the fire upon the grate D to the opening *d*, through which they escape into the annular space between the boiler A and the masonry E. This space is divided by vertical partitions *ee*, which extend to a point near the bottom of the same, leaving openings under them, as shown in Fig. 1, where the boiler is broken away to show said partition *e*.

F is an opening through which the said products of combustion finally escape to some suitable chimney.

*b* is a pipe to convey steam or hot water to the radiators, and *b'* a pipe to return the same to the boiler when cooled or condensed.

*f* is a cover, which can be removed to supply fuel to the magazine C.

*g* is a plate which closes the top of the flue B and also the space between the boiler A and the masonry E.

By constructing the flue B, the magazine C, and the diaphragm *c* as shown I utilize their combined strength to resist the pressure upon the outside of the flue B, which being large would otherwise collapse unless stayed to the boiler A. I thus avoid the expense and inconvenience of the usual stay-bolts.

The operation of my device is as follows: The boiler A being supplied with a suitable quantity of water, a fire is kindled upon the grate D, and the magazine C filled with coal or other suitable fuel, which will continue to feed down upon the fire as it is consumed. The products of combustion pass upward through the spiral passage between the convolutions of the diaphragm *c*, escaping through the opening *d*. They then pass downward on one side of the boiler A, thence horizontally under the partitions *ee*, thence upward on the other side of the said boiler, finally escaping to the chimney by the opening F. Both the inner surface of the flue B and the entire outer surface of the boiler A are thus exposed to the heat. The diaphragm *c* also absorbs heat and conducts it to the flue B. By causing the products of combustion to pursue the course described a large amount of heating-surface is obtained, and the heat is effectively transmitted to the contents of the boiler.

What I claim, and wish to secure, is as follows:

1. In an upright boiler, a fuel-magazine within a large flue, having an annular space between said magazine and said flue, in combination with a spiral diaphragm within said space to direct the circulation of the products of combustion and strengthen said flue.

2. An upright boiler, A, having an annular flue, B, and connecting-pipe *d*, in combination with an outer casing, E, and partitions *ee*, arranged to cause the products of combustion to pass over the outside of said boiler before reaching the chimney F, substantially as described.

EDWARD F. WARD.

Witnesses:

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