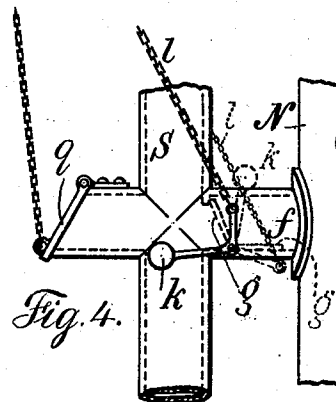
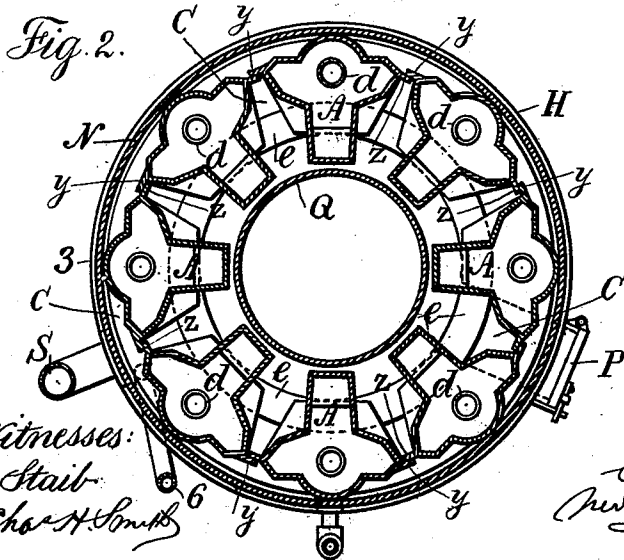
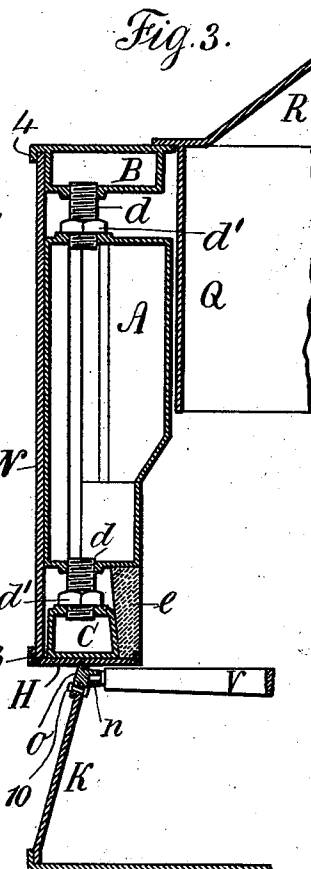
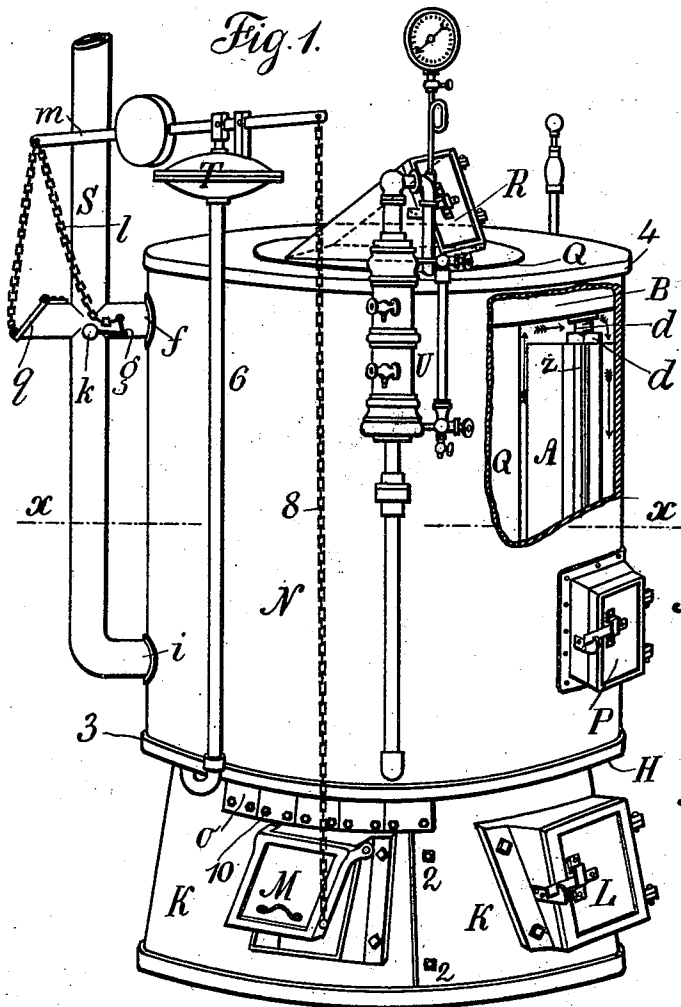


(No Model.)

C. W. WARNOCK.  
BOILER FOR HEATING APPARATUS.

No. 511,569.

Patented Dec. 26, 1893.



Witnesses:  
J. Stait  
Chas. H. Smith

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# UNITED STATES PATENT OFFICE.

CHARLES W. WARNOCK, OF GENEVA, NEW YORK.

## BOILER FOR HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 511,569, dated December 26, 1893.

Application filed June 3, 1893. Serial No. 476,449. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES W. WARNOCK, a citizen of the United States, residing at Geneva, in the county of Ontario and State of New York, have invented an Improvement in Boilers for Heating Apparatus, of which the following is a specification.

This improvement is especially intended for the generation of steam to be used in heating buildings, and the improvements are made with reference to obtaining a large extent of heat absorbing surface in a small compass, for conveniently connecting the respective parts of the apparatus and disconnecting the same when repairs are needed. I make use of a circular range of cast iron vessels or tubes connected at their upper and lower ends to hollow rings, and these vessels are adapted to receive between them a magazine or hopper for supplying coal to the fire chamber in the lower portion of the apparatus; and I provide for setting together the supporting base of the apparatus that forms the ash-pit and receives the draft regulating doors, so that the apparatus may be adapted to the different positions and circumstances of use.

In the drawings, Figure 1 is an elevation in perspective and partly in section illustrating the present improvement. Fig. 2 is a sectional plan at the line *x x*. Fig. 3 is a vertical section through one of the water holding chambers or tubes. Fig. 4 is an elevation of the flues and regulating dampers.

The water holding chambers or tubes A are sufficient in number to form a circular range and each tube is of substantially the form shown in the sectional plan Fig. 2, and these tubes are preferably of cast iron with a hollow inward projection that is trapezoidal in sectional form and the outer portion of the tube is curved, and there are vertical flanges *y* and *z* upon the edges of the tubes, the flange *y* on one tube lapping against the flange *z* on the next tube so as to form a substantially closed range around in the circle, and above the circular range of tubes is a hollow annular chamber B and there is a similar annular chamber C below these tubes and around the fire chamber, there being fire-brick at *e* between the fire and the annular chamber C, and the upper and lower ends of the tubes A are connected with the respective chambers

B and C by the thimbles or short tubular sections *d* which are screwed into their respective places and preferably provided with lock nuts *d'* to make the joints tight, and there is a flat ring H upon which the annular chamber C rests and also the fire-brick *e*, and this ring H rests upon the conical base K which forms the ash-pit, and this base K is made of quarter sections bolted together, as shown at 2, in order that the respective sections containing the ash door L and the regulating damper M may be placed in the proper positions for convenient use, and it is also advantageous to make the base in sections so that they are not so large and heavy to handle, and so that either section can be replaced in case of injury without having to disturb the entire furnace; and there is an inclosing case N between the flange 3 at the edge of the ring H and the flange 4 at the edge of the annular chamber B, and this inclosing case may be of sheet metal or other suitable material, and it rests against the curved outer portions of the tube so as to form a series of flues between the case and the tubes.

The door P is at one side of the case N and two of the tubes A are properly shaped in the lower portions to form the opening behind the door P by which access is given to the fire chamber, and I make use of a magazine Q having an outwardly projecting flange by which it is hung from the annular chamber B, and it is provided with a fuel door R to give access for the insertion of the coal.

There are two openings from the case N to the ascending flue S, the one opening at *f* and the other at *i* and at the junction of the vertical pipe or flue S and the pipe *f* there is a damper *g* and there is also an air inlet with a damper at *q*; and I provide a pressure diaphragm T and its connecting pipe 6 to the lower portion of the furnace as usual and a lever *m* and chains to the respective dampers *g* and *q*, and there is also a chain 8 to the damper M in the base of the furnace; which damper M is opened when the pressure decreases below the minimum and closes as the pressure increases as usual, and the damper *g* has a counterweight *k* which ordinarily tends to keep the damper closed, but when the damper is thrown over by hand into the position indicated in dotted lines in Fig. 4

there is a direct draft through the pipe *f* to the escape flue *S* for starting the fire, but when the pressure increases the chain *l* to the lever *m* throws the damper over and the weight *k* keeps the same closed, and the duty of the lever *m* and the chain connecting to the draft regulator *q* is simply to open or close the air inlet according to the steam pressure.

It will now be understood that the products of combustion when the fire is started pass up inside the range of tubes *A* and by the direct draft *f*, and as soon as the damper *g* is closed the products of combustion pass up and around the magazine *Q* over the range of pipes *A* and descend between the case *N* and such range of tubes *A*, and said products of combustion pass by the pipe *i* to the flue *S*; and it will be noticed that there is a large extent of heating surface by the direct contact of the fire and the products of combustion with the surfaces of the tubes *A* as the products of combustion pass up on one side of the tubes and down on the other, and the heat also acts upon the under surfaces of the annular chamber *B* and upon the upper and outer surfaces of the annular chamber *C* and by conduction from the fire-brick *e* to the inner portion of the annular chamber *C*, and the water is to be supplied into the apparatus as usual, and the water level is indicated by the glass gage *U* as usual, and the annular chamber *B* is preferably a steam chamber and from this steam is conveyed to any ordinary radiating devices.

Any desired character of grate may be made use of in this apparatus, but I prefer to employ grate-bars *V* that may be rocked or rotated either separately or conjointly for shaking out the ashes, and the axis of each grate-bar at one end passes through a suitable opening in one of the base sections *K*, so as to receive a shaking lever or bar, and the axis at the other end of such grate-bar *V* is received into a hollow truncated cone *n* upon the movable plate *O* and there is a separate plate for each grate-bar and these plates are bolted on to one of the sections *K* by the bolts *10* so that by removing the bolts of either plate it may be taken off and the grate-bar drawn out and another bar introduced and the plate

bolted into its place without disturbing the other grate-bars of any portion of the apparatus. This is a great convenience especially in apparatus of this character.

I claim as my invention—

1. The combination with the annular chambers *B* and *C* and the circular range of vertical tubes and their tubular connections, of the ring plate *H* upon which the annular chamber *C* rests, and the fire-brick *e* resting upon the inner portion of such ring *H* and extending up to the lower ends of the vertical tubes, so as to inclose and protect the annular chamber *C*, and the connections between the same and the lower ends of the vertical tubes, substantially as set forth.

2. The combination with the annular chambers *B* and *C* and the circular range of vertical tubes and their tubular connections, of the ring plate *H* upon which the annular chamber *C* rests, and the fire-bricks *e* resting upon the inner portion of such ring *H* and extending up to the lower ends of the vertical tubes, so as to inclose and protect the annular chamber *C*, and the connections between the same and the lower ends of the vertical tubes, the base *K* made of separate sections bolted together, one section having the ash-door and another section the damper for allowing the relative positions of the ash-door and damper to be varied, substantially as set forth.

3. The combination in a furnace with an inclosing case, of a circular range of vertical cast iron tubes, such tubes being trapezoidal in sectional form at the edges next to the fire and widened and rounded in the outer portions and provided with flanges upon the vertical edges, the flanges of one tube lapping upon the flanges of the next tube to form flues between the case and the tubes, annular chambers above and below the circular range of vertical tubes, and tubular connections between the ends of the hollow cast iron tubes and the respective annular chambers, substantially as set forth.

Signed by me this 24th day of May, 1893.

CHARLES W. WARNOCK.

Witnesses:

CHAS. F. LEONARD,  
HENRY L. DE ZENG, Sr.