

No. 850,812.

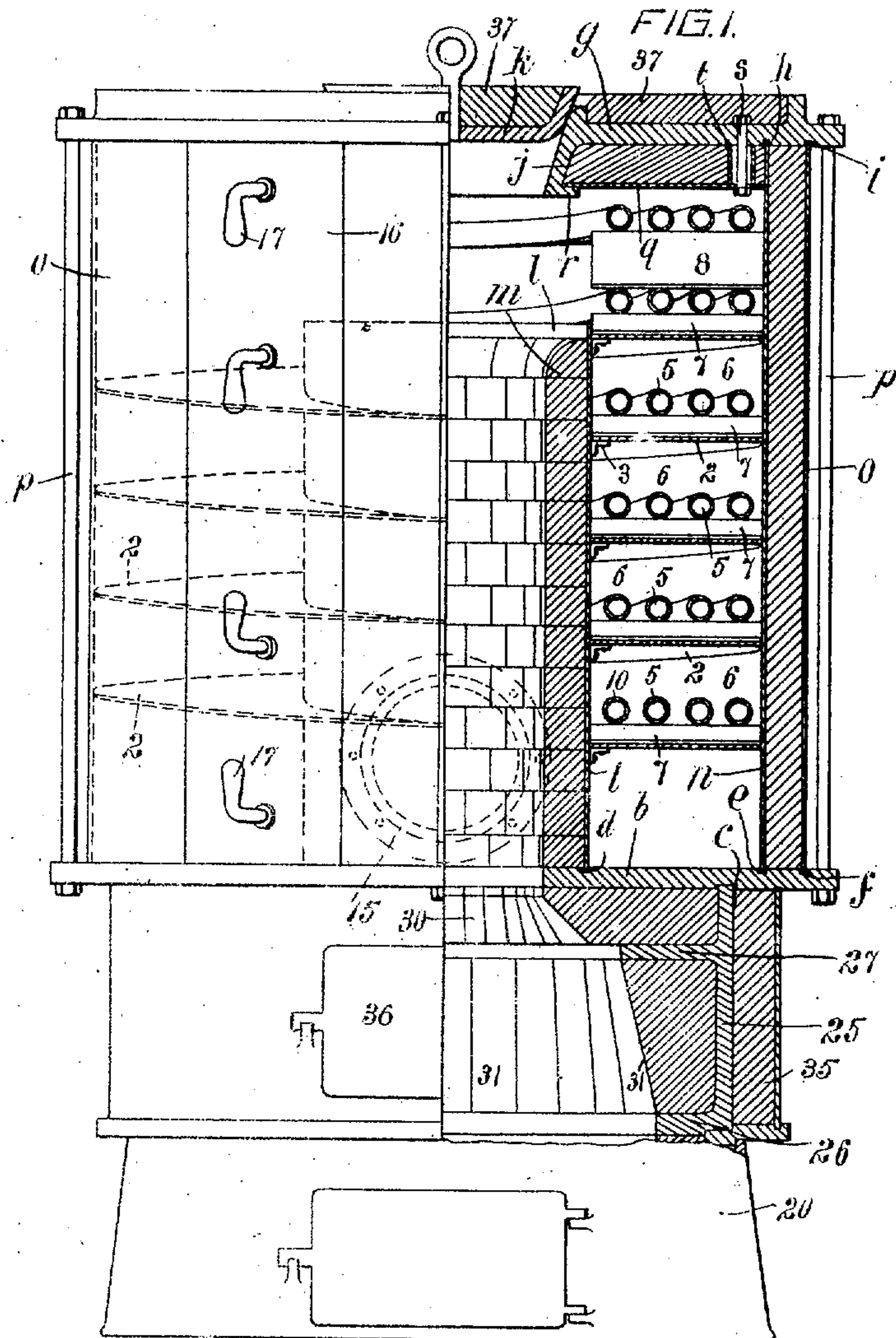
PATENTED APR. 16, 1907.

E. G. M. CAPE & R. J. DURLEY.

HEATER.

APPLICATION FILED MAY 2, 1904.

2 SHEETS—SHEET 1.



Witnesses

Alex Currie.
Wm. J. Davis

Edmund S. M. Cape
Richard J. Durley
Inventors

By Attorney

Wm. N. Evans

No. 850,818.

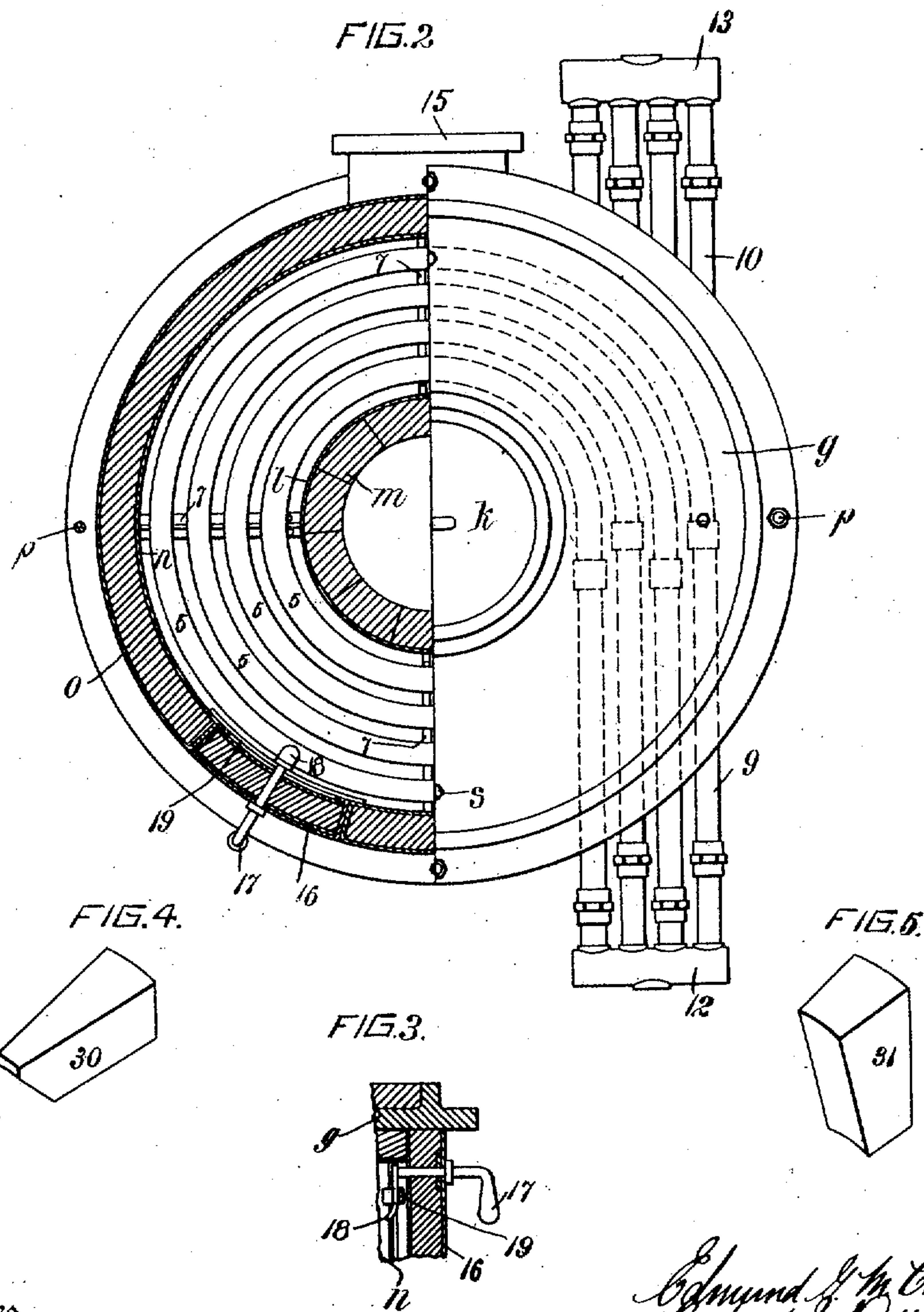
PATENTED APR. 16, 1907.

E. G. M. CAPE & R. J. DURLEY.

HEATER.

APPLICATION FILED MAY 2, 1904.

2 SHEETS—SHEET 2.



Witnesses

Alex. C. G. G. G.
W. J. G. G.

Edmund J. M. Cape
Richard J. Durley
Inventors
By Attorney
W. J. G. G.

UNITED STATES PATENT OFFICE.

EDMUND GRAVES, MEREDITH CAPE AND RICHARD JOHN DURLEY, OF
MONTREAL, QUEBEC, CANADA.

HEATER.

No. 850,818.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed May 2, 1904. Serial No. 206,083.

To all whom it may concern:

Be it known that we, EDMUND GRAVES, MEREDITH CAPE and RICHARD JOHN DURLEY, both of the city of Montreal, Province of Quebec, Dominion of Canada, have invented certain new and useful Improvements in Heaters; and we do hereby declare that the following is a full, clear, and exact description of the same.

Our invention relates particularly to heaters for use in connection with the heating of compressed air or the superheating of steam, although the principal features thereof may be applied with advantage to other than compressed-air heaters or steam-superheaters.

The invention has for its object to provide a heater which will be more durable at high temperatures and high pressures, will give higher efficiency, and be more cheaply constructed and more easily kept in order and cleaned than has been the case with heaters heretofore.

Our invention may be said, briefly, to consist of a heater comprising a spiral flue or passage having one or more spiral tubes therein and supported above the floor thereof with means for causing the heated gases of combustion to be directed into contact with the tube or tubes.

More specifically speaking, the invention may be said to consist of a stationary member adapted to form one wall of the flue or passage and to support the main parts of the heater and a removable member forming with the said stationary member the inclosure which constitutes the flue or passage and the removal whereof enables the parts supported by the permanent or stationary member to be inspected and cleaned or repaired, the main parts consisting, preferably, of a spiral plate constituting two of the opposite walls of the flue or passage, and means for supporting one or more spiral tube or tubes away from the walls and for causing the heated gases of combustion to be directed into contact with the tube or tubes together with the said tube or tubes.

An additional feature of our invention consists of a fire-box section having an annular flange separating the portion thereof subjected to the greatest wear from the portion not so subjected.

For full comprehension, however, of our

invention reference must be had to the accompanying drawings, forming a part of this specification, in which similar reference characters indicate the same parts, and wherein—

Figure 1 is a part front elevation and a part longitudinal vertical sectional view of a heater constructed according to our invention. Fig. 2 is a part plan view and part horizontal sectional view thereof, the sectional view being taken on line A A, Fig. 1. Fig. 3 is a detail sectional view illustrating the manner of securing our removable door in place, and Figs. 4 and 5 are perspective views of the fire-bricks located in the upper and lower portions, respectively, of our improved fire-box.

According to the preferred embodiment of our invention, the base-plate *b* is of annular form and has an annular recess or groove *c* in its under side concentric to the opening therein, and its upper side has a series of three grooves or recesses also concentric to the central opening. The first, *d*, of these grooves is located a short distance from the central opening, and the others, *e* and *f*, respectively, are located a short distance from the outer edge, and a capping-plate *g* is formed in its under side with a pair of grooves *h* and *i*, corresponding in diameter and position to the grooves *e* and *f*. The inner edge of this capping-plate has an outwardly-flared annular flange *j*, within the upper end of which rests a removable cover *k*. A central cylindrical member *l* stands in the groove *d* and extends upwardly about three-quarters ($\frac{3}{4}$) the distance between the base-plate *b* and capping-plate *g* and has a fire-brick lining *m*, which is supported upon the portion of the base-plate *b* within the cylindrical section *l*. A second cylindrical section *n* rests in the groove *e* and the upper end thereof projects into groove *h* in the under side of the capping-plate and, together with a third cylindrical section, supports the said capping-plate, such third cylindrical section being indicated at *o* and resting in the groove *f* in the base-plate *b*, while the groove *i* of the capping-plate fits upon its upper end. A series of bolts *p* secure the base-plate, capping-plate, and cylindrical sections *n* and *o* together, and a lining-plate *q* of annular form is supported upon the outwardly-flanged lower end *r* of the annular flange *j*, while it is supported near its opposite edge by bolts *s*, encircled by tubular dis-

5 tance-pieces *l*. The spaces between the cylindrical members *n* and *o* and the lining-plate *g*, and capping-plate *g*, are filled with asbestos or other non-heat-conducting material.

10 The spiral flue or passage is constituted by the cylindrical sections *l* and *n*, and a spiral plate 2 located between them and extending from one to the other, such spiral plate being supported at its inner edge by a series of
15 angle-iron brackets 3, riveted or otherwise secured by one leg to the cylindrical member *l* and by the other leg to the inner edge of such spiral plate. A series of spiral tubes 5 (four are indicated, although more or less
20 may be used, according to requirements) are wound into the spiral flue or passage 6, constructed as above described, and are supported above the floor (constituted by spiral
25 plate 2) of the flue by a series of preferably radially-disposed T-irons 7 resting upon the floor and a second series 8 resting upon the
30 second to top convolution of the series of pipes, the latter series of T-irons supporting the uppermost convolution, while the balance of the pipes is supported upon the other,
35 the T-irons 7. One end of this series of pipes extends through the wall of the heater near its upper end, as at 9, and the opposite end extends through the lower end of said
40 wall, as at 10, while the pipes at each end are coupled to a common head, (indicated at 12 and 13, respectively.) A chimney connection 15 is located near the lower end of the casing, and a manhole extending approximately
45 from the bottom to the top of the casing is cut therethrough and provided with a removable cleaning-door 16, having a series of handles 17, with locking devices 18 on their
50 inner ends, said locking devices consisting of curved bars adapted to engage cross-bars 19 extending across the inner side of the manhole.

Our improved fire-box section consists of a cylindrical wall member 25, having an inwardly-projecting radial flange 26 at its lower
55 end and a similar flange 27, but of greater width, projecting from the wall near the upper end thereof, thereby providing spaces separated from one another, one between the
60 flange 27 and the top of the fire-box section and the other between such flange and the flange 26, the first-mentioned space accommodating the series of horizontal fire-bricks 30 and the second-mentioned space accommodating the second series of fire-bricks 31. This construction of fire-box enables either series of fire-bricks or any portion thereof to be removed and new ones inserted without disturbing the other section, and the fire-box
65 section is provided with an asbestos jacket 35, similar to that upon the body of the heater, and a fire-door 36 of usual construction, while the capping-plate and cover *k* are also provided with a covering 37, of asbestos.

The ash-pit section 20 may be of any pre-

ferred construction, as it forms no part of our invention.

This heater is designed particularly for use in connection with heating of compressed air or the superheating of steam; but it is obvious that changes may be made in the specific construction or relative arrangement of the parts or other minor changes made without departing from the spirit of our invention.

In this embodiment of our invention the exterior of the spiral tubular ducts and the interior of the spiral flue or passage can be thoroughly cleaned without the removal of the former or of the spiral plate by removing the capping-plate and the inclosing cylindrical sections *n* and *o*, the tubes and plate being mounted upon the stationary inner cylindrical member for the purpose.

We do not claim the specific fire-box herein illustrated and described, as it forms the subject-matter of a separate application.

What we claim is as follows:

1. In a fluid-heater, the combination with a combustion-chamber and a chimney connection, of a spiral flue or passage leading from the combustion-chamber to the chimney connection, and a fluid-conducting section extending through the interior of the spiral flue or passage, and means in contact throughout its length with one of the walls of such flue for deflecting the current of heated gases of combustion as they flow through such spiral flue or passage and causing the gases to come into contact with the fluid-conducting section.

2. In a fluid-heater, the combination with a combustion-chamber, a chimney connection, and a flue or passage leading from the combustion-chamber to the chimney connection, of a fluid-conducting section extending through the interior of the flue or passage, and means in contact throughout its length with one of the walls of such flue for deflecting the current of heated gases of combustion flowing through the flue or passage and causing the same to come in contact with the fluid-conducting section.

3. In a fluid-heater, the combination with a combustion-chamber, a chimney connection, and a flue or passage leading from the combustion-chamber to the chimney connection, of a fluid-conducting section extending longitudinally through the interior of the flue or passage, and means independent of and supporting the fluid-conducting section above the floor of such flue or passage, such means in contact throughout its length with one of the walls of such flue acting as deflectors for mixing the current of heated gases of combustion flowing through the flue or passage and causing the same to come in contact with the fluid-conducting section for the purpose set forth.

4. In a heater, the combination with a fire-chamber, a cylindrical member communicating

ing at one end with the fire-chamber, a chimney connection located adjacent to the fire-chamber, and means separating the chimney connection from the fire-chamber, a spiral flue or passage communicating at one end with the end of the cylindrical member opposite to the fire-chamber the said spiral flue or passage communicating at its other end with the chimney connection, and means whereby the heat emanating from the heated gases of combustion flowing through the flue or passage is taken up.

5. In a heater, the combination with a vertically-elongated combustion-chamber, an outlet for the gases of combustion located on a level with the lower end thereof and separated therefrom, of a vertical spiral flue or passage communicating at its upper end with the upper end of the elongated combustion-chamber, and at its lower end with the chimney connection and means whereby the heat emanating from the heated gases of combustion flowing through the flue or passage is taken up.

6. In a heater, the combination with a vertically-elongated combustion-chamber, a chimney connection located on a level with the lower end thereof and separated therefrom, of a vertical spiral flue or passage communicating at its upper end with the upper end of the elongated combustion-chamber, and at its lower end with the chimney connection, and means whereby the heat emanating from the heated gases of combustion flowing through the flue or passage is taken up.

7. In a heater, the combination with a vertical elongated cylindrical combustion-chamber, of a spiral plate wound around the exterior of the cylindrical chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate, the spiral flue or passage thus formed communicating at its upper end with the upper end of the combustion-chamber and at its lower end with a chimney connection communicating with the lower end of the inclosing casing, and means whereby the heat emanating from gases of combustion flowing through the flue or passage is taken up.

8. In a heater, the combination with a vertical elongated cylindrical combustion-chamber, of a spiral plate wound around the exterior of the cylindrical chamber, means securing the inner edge of the spiral plate rigidly to the cylindrical chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate and having a chimney connection near the lower end thereof, the spiral flue or passage thus formed communicating at its upper end with the upper end of the combustion-chamber and at its lower end with the chimney connection, and means whereby the heat emanating from the heated

gases of combustion flowing through the flue or passage is taken up.

9. In a heater, the combination with a vertical elongated cylindrical combustion-chamber having a fire-brick lining, of a spiral plate wound around the exterior of the cylindrical chamber, means securing the inner edge of spiral plate rigidly to the cylindrical combustion-chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate and having a chimney connection near the lower end thereof, the spiral flue or passage thus formed communicating at its upper end with the upper end of the combustion-chamber and at its lower end with the chimney connection and a non-heating jacket encircling the said inclosing casing, and means whereby the heat emanating from the heated gases of combustion flowing through the flue or passage is taken up.

10. In a heater, the combination with a vertical elongated combustion-chamber, of a spiral plate wound around the exterior of the cylindrical chamber, means securing the inner edge of the spiral plate rigidly to the cylindrical combustion-chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate and having a chimney connection near the lower end thereof, the spiral flue or passage thus formed communicating at its upper end with the upper end of the combustion-chamber and at its lower end with the chimney connection and a fluid-conducting section extending in connection with and subjected to the heat emanating from the products of combustion flowing through such spiral flue or passage.

11. In a heater, the combination with a vertical elongated cylindrical combustion-chamber, of a spiral plate wound around the exterior of the cylindrical chamber, means securing the inner edge of the spiral plate rigidly to the cylindrical combustion-chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate and having a chimney connection near the lower end thereof, the spiral flue or passage thus formed communicating at its upper end with the combustion-chamber and at its lower end with the chimney connection, and a series of fluid-conducting sections independent of one another, and subjected to the heat emanating from the products of combustion flowing through such spiral flue or passage.

12. In a heater, the combination with a vertical elongated cylindrical combustion-chamber, of a spiral plate wound around the exterior of the cylindrical chamber means securing the inner edge of the spiral plate rigidly to the cylindrical combustion-chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate and

having a chimney connection near the lower end thereof, the spiral flue or passage thus formed communicating at its upper end with the upper end of the combustion-chamber and at its lower end with the chimney connection, and a spiral fluid-conducting section extending longitudinally through the interior of the spiral flue or passage.

13. In a heater, the combination with a vertical elongated cylindrical combustion-chamber, of a spiral plate wound around the exterior of the cylindrical chamber, means securing the inner edge of the spiral plate rigidly to the cylindrical combustion-chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate and having a chimney connection near the lower end thereof, the spiral flue or passage thus formed communicating at its upper end with the upper end of the combustion-chamber and at its lower end with the chimney connection, and a fluid-conducting section extending in connection with and subjected to the heat emanating from the products of combustion flowing through the spiral flue or passage, and means for deflecting the current of heated gases of combustion as they flow through the spiral flue or passage and causing the gases to come into contact with such fluid-conducting section.

14. In a heater, the combination with a vertical elongated cylindrical combustion-chamber, of a spiral plate wound around the exterior of the cylindrical chamber means securing the inner edge of the spiral plate rigidly to the cylindrical combustion-chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate and having a chimney connection near the lower end thereof, the spiral flue or passage thus formed communicating at its upper end with the upper end of the combustion-chamber and at its lower end with the chimney connection, and a spiral fluid-conducting section extending longitudinally through the interior of the spiral flue or passage, and means for deflecting the current of heated gases of combustion flowing through the flue or passage and causing the same to come in contact with such fluid-conducting section.

15. In a heater, the combination with a vertical elongated cylindrical combustion-chamber, of a spiral plate wound around the exterior of the cylindrical chamber means securing the inner edge of the spiral plate rigidly to the cylindrical combustion-chamber, an inclosing casing encircling and fitting closely the outer edge of the spiral plate and having a chimney connection near the lower end thereof, the spiral flue or passages thus formed communicating at its upper end with the upper end of the combustion-chamber and at its lower end with the chimney connection, and a spiral fluid-conducting section extending longitudinally through the in-

terior of the spiral flue or passage, and means supporting the fluid-conducting section above the floor of such flue or passage.

16. A heater consisting of an annular base-plate, a cylindrical member of slightly-greater diameter than the opening in such annular base-plate and supported upon the latter concentrically to the opening therein, a fire-brick lining within the cylindrical member and resting upon the portion of the base-plate within the same, a spiral plate wound around the exterior of the cylindrical member, means securing the inner edge of the spiral plate rigidly to the cylindrical member, a series of inverted-T irons supported upon the spiral plate, a tubular fluid-conductor of spiral form wound around the cylindrical member within the spiral space formed by the spiral plate and having one end terminating above the level of the top of the cylindrical member, and its other end located near the bottom of the latter, such spiral tube resting upon the inverted-T irons, a cylindrical member encircling and fitting closely the outer edge of the spiral plate and supported upon the annular base-plate, and a capping-plate supported upon the last-mentioned cylindrical member, a chimney connection leading from the inclosing cylindrical member, and means whereby the ends of the spiral tubular conductor are connected to piping outside of the heater.

17. A heater consisting of an annular base-plate, a cylindrical member of slightly-greater diameter than the opening in such annular base-plate and supported upon the latter concentrically to the opening therein, a fire-brick lining within the cylindrical member and resting upon the portion of the base-plate within the same, a spiral plate disposed horizontally and wound around the exterior of the cylindrical member, means securing the inner edge of the spiral plate rigidly to the cylindrical member, a series of inverted-T irons supported upon the spiral plate, a series of tubular fluid-conductors of spiral form wound around the cylindrical member within the spiral space formed by the spiral plate and having one end terminating above the level of the top of the cylindrical member, and its other end located near the bottom of the latter, such spiral tube resting upon the inverted-T irons, a cylindrical member encircling and fitting closely the outer edge of the spiral plate and supported upon the annular base-plate, and a capping-plate supported upon the last-mentioned cylindrical member, a chimney connection leading from the inclosing cylindrical member, and means whereby the ends of the series of tubular conductors are connected to piping outside of the heater.

18. A heater consisting of an annular base-plate, a cylindrical member of slightly-greater diameter than the opening in the an-

nular base-plate and supported upon the latter concentrically to the opening therein, a fire-brick lining within the cylindrical member and resting upon the portion of the base-plate within the same, a spiral plate disposed horizontally and wound around the exterior of the cylindrical member, means securing the inner edge of the spiral plate rigidly to the cylindrical member, a series of inverted-T irons supported upon the spiral plate, a tubular fluid-conductor of spiral form wound around the cylindrical member within the spiral space formed by the spiral plate and having one end terminating above the level of the top of the cylindrical member, and its other end located near the bottom of the latter, such spiral tube resting upon the inverted-T irons, a cylindrical member encircling and fitting closely the outer edge of the spiral plate and supported upon the annular base-plate, an annular capping-plate supported upon the last-mentioned cylindrical member, a cover for the opening in the annular capping-plate, a chimney connection leading from the inclosing cylindrical member, and means whereby the ends of the spiral tubular conductor are connected to piping outside of the heater.

19. In a heater comprising a spiral plate, a spiral fluid-conducting section, and a pair of cylindrical members forming with the spiral plate a spiral flue or passage, and means whereby the spiral plate and spiral fluid-conducting section are supported by one of the

cylindrical members independently of the other cylindrical member, a base-plate for supporting the cylindrical member, and a capping-plate extending across and closing the top of the outermost cylindrical member with a space therebetween and the top of the innermost cylindrical member for the purpose set forth.

20. In a heater comprising a spiral plate, a spiral fluid-conducting section, extending parallel to the spiral plate and above the same, and a pair of cylindrical members forming with the spiral plate a spiral flue or passage inclosing the spiral fluid-conducting section, and means whereby the spiral plate and spiral fluid-conducting section are supported, a base-plate for supporting the cylindrical member, and a capping-plate extending across and closing the top of the outermost cylindrical member with a space therebetween and the top of the innermost cylindrical member, the outer cylindrical member having an elongated hand-hole therein, and a removable door for closing such hand-hole, substantially as described and for the purpose set forth.

In testimony whereof we have affixed our signatures in presence of two witnesses.

EDMUND GRAVES MEREDITH CAPE.
RICHARD JOHN DURLEY.

Witnesses:

WILLIAM L. McFEAT,
FRED. J. SEARS.