

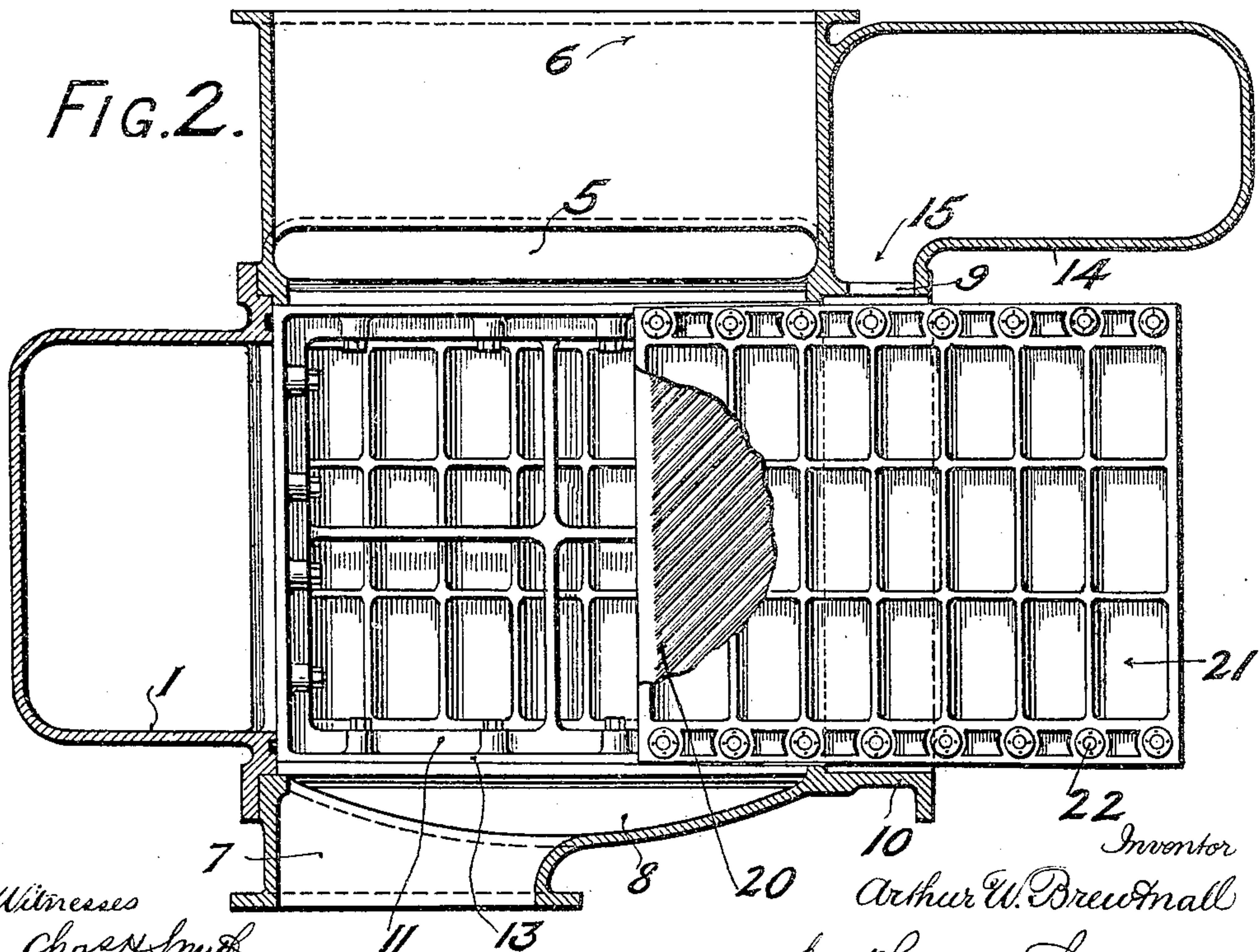
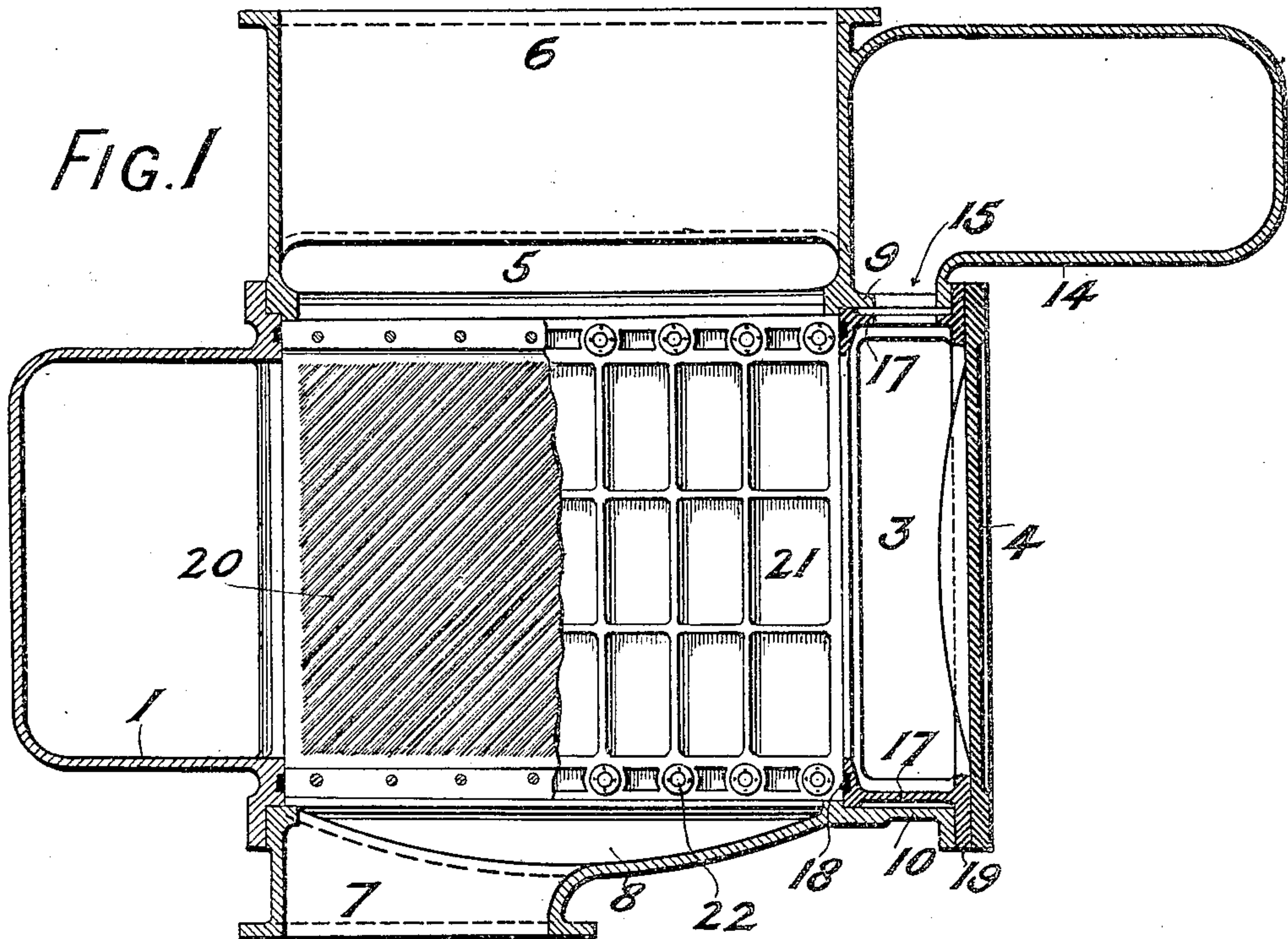
No. 800,977.

PATENTED OCT. 3, 1905.

A. W. BREWTHALL.
SURFACE HEATING OR COOLING APPARATUS.

APPLICATION FILED MAY 24, 1905.

4 SHEETS—SHEET 1.



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H. Berrell

Inventor
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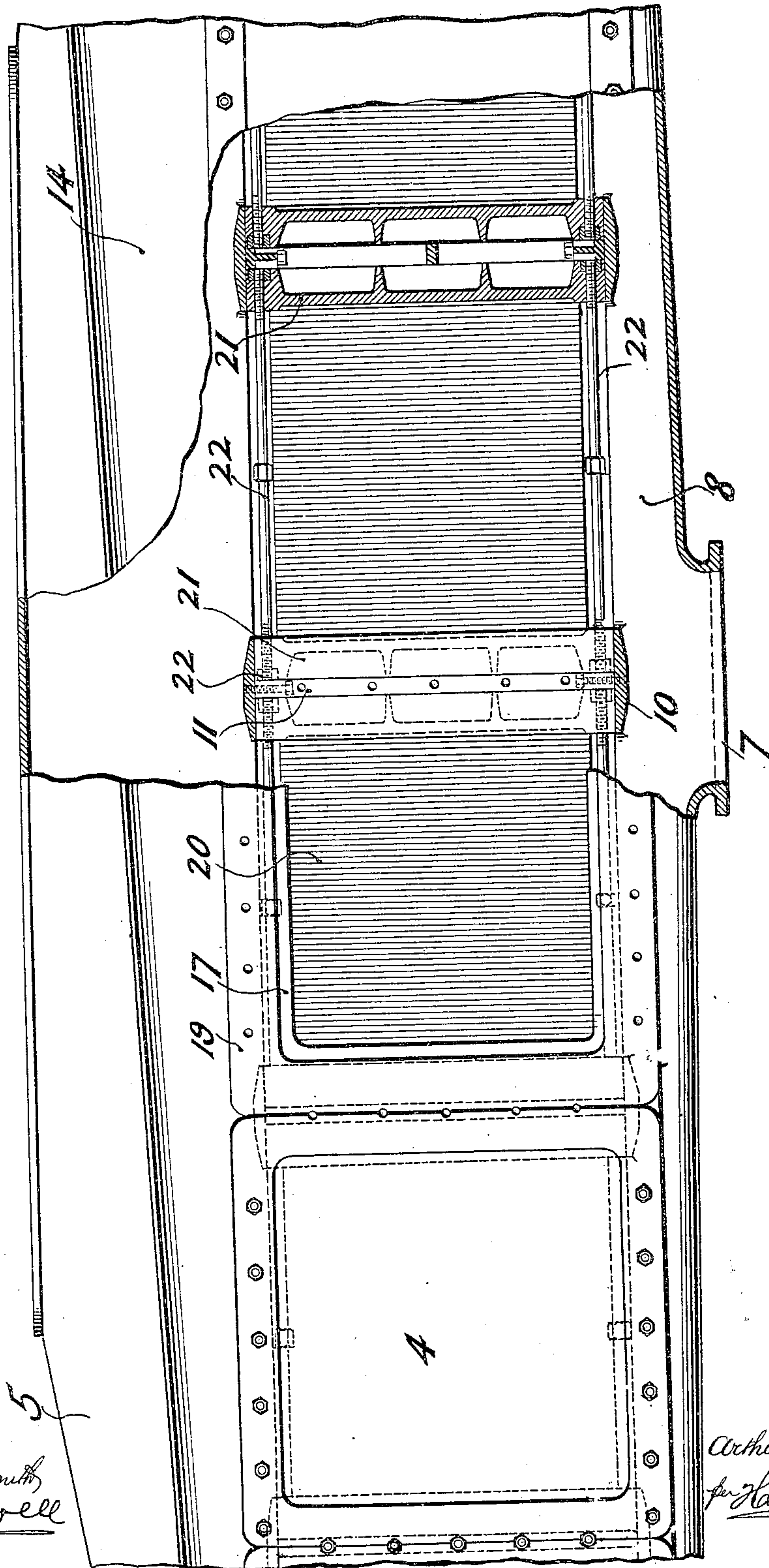
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4 SHEETS—SHEET 2.

FIG. 3.



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4 SHEETS—SHEET 3.

FIG: 4.

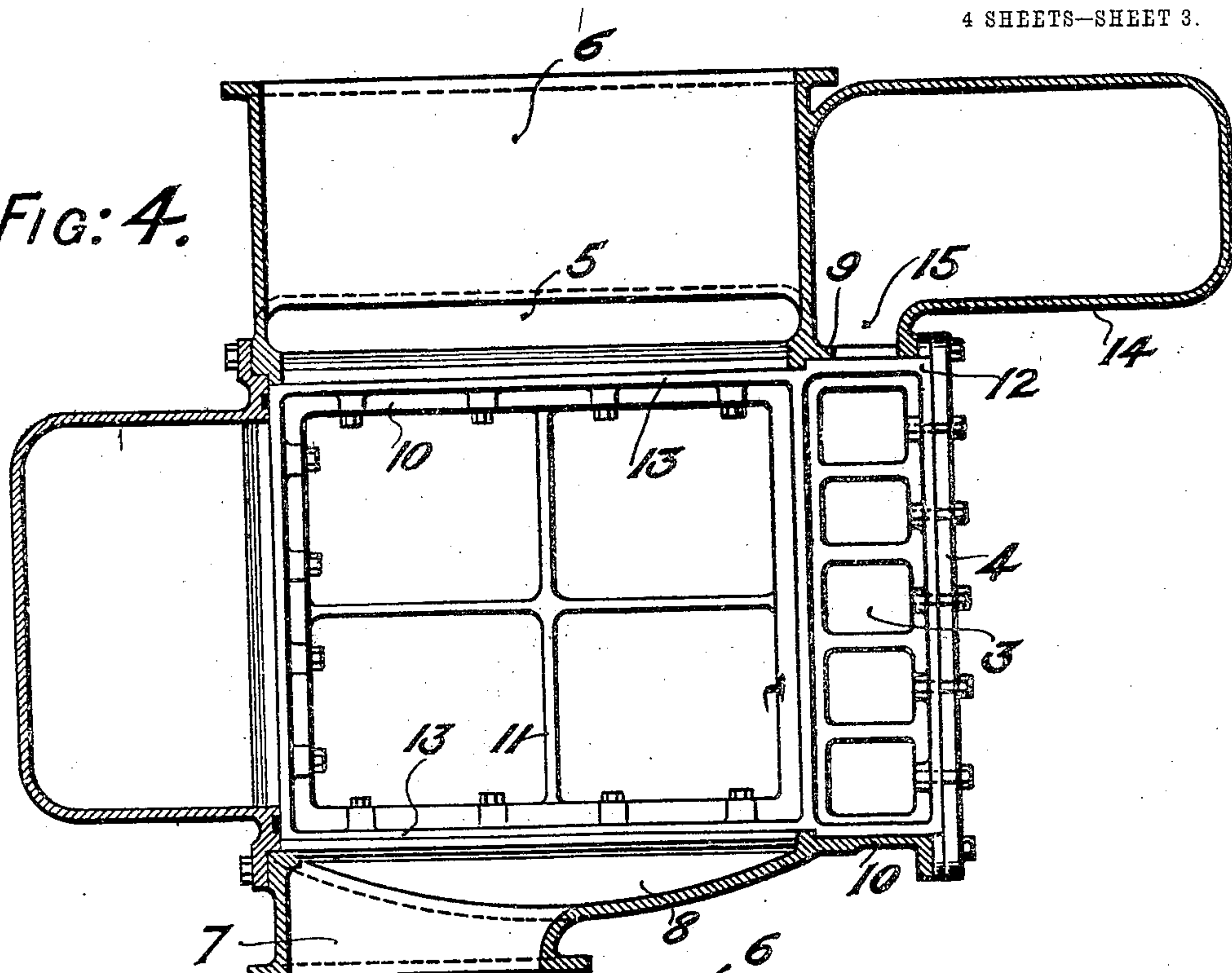
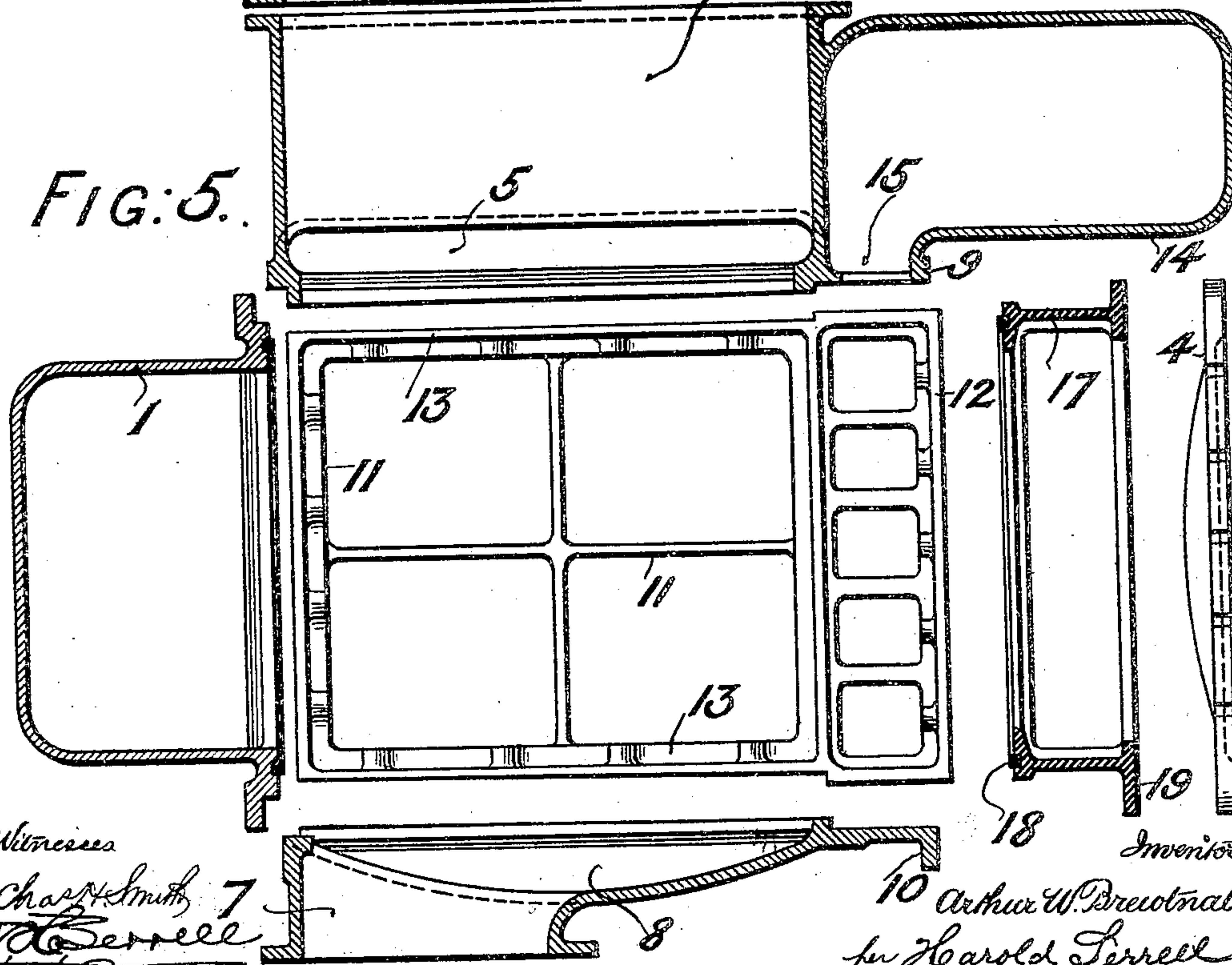


FIG: 5.



Witnesses
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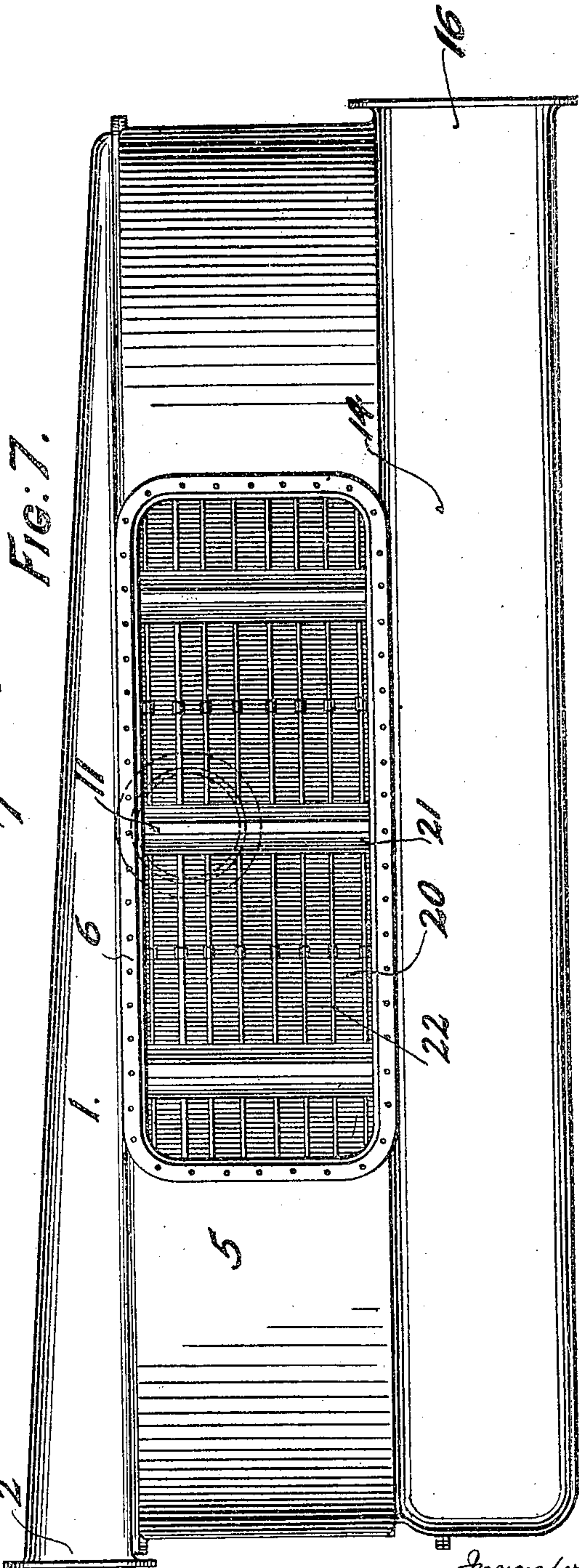
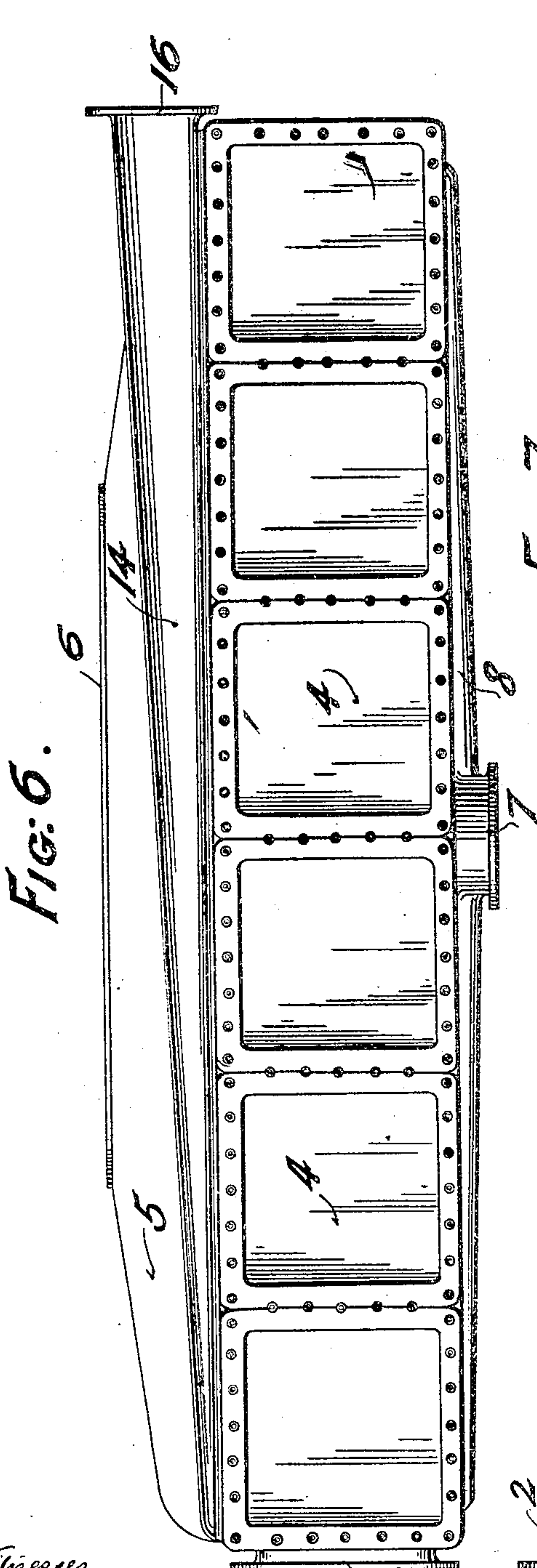
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Witnesses

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UNITED STATES PATENT OFFICE.

ARTHUR WILFRED BREWTNALL, OF NEWCASTLE-UPON-TYNE, ENGLAND.

SURFACE HEATING OR COOLING APPARATUS.

No. 800,977.

Specification of Letters Patent.

Patented Oct. 3, 1905.

Application filed May 24, 1905. Serial No. 262,073.

To all whom it may concern:

Be it known that I, ARTHUR WILFRED BREWTNALL, a subject of the King of Great Britain, residing at Newcastle-upon-Tyne, in the county of Northumberland, England, have invented certain new and useful Improvements in Surface Heating or Cooling Apparatus, of which the following is a specification.

In surface heating or cooling apparatus a casing has been employed having four conduits and tubular connections by which two mediums are separately conducted into and out of the casing, passing through a structure contained within the casing in different directions.

The present invention refers to an improved casing of this type to contain any surface heating or cooling structure constructed with passages extending through from side to side for the passage of one medium alternating with adjacent and separate passages extending through the structure from end to end for the passage of the other medium, so that two of the aforesaid conduits of the casing conduct one medium to and from the passages extending from side to side of the contained structure, while the other two conduits conduct the other medium to and from the other passages extending from end to end of the contained structure. Broadly, such casings for containing such passaged structures have been heretofore employed; but difficulties have been experienced in removing the passaged structure or structures from the interior of the casing, because to do so it has been necessary to disconnect the tubes or conduits by which the mediums or elements are conducted to or from the casing, although it is highly desirable that such contained structures should be capable of ready removal without disconnection of the supply-tubes; and the object of this invention is to provide a construction of casing whereby the contained structure (or structures, where the casing contains several) can be easily removed. A type of passaged structure which the aforesaid casing is particularly designed to contain consists of indented or corrugated plates arranged in surface contact, or nearly so, and fitted or assembled together to form what I will term a "bunch" and so that between the said plates alternate chambers are formed through which the cooling or heating medium and the medium to be cooled or heated can pass in different directions. The novel and improved construction of such a casing as hereinafter

described and claimed is such that a bunch of plates can be bodily removed from the casing without it being necessary to disconnect any of the conduits or tubular connections, or where the casing contains a plurality of bunches of plates all of the said bunches or any particular bunch of plates can be removed also without disconnection of the tubes or conduits by which the elements are conducted to or from the said casing. Such an improved construction of casing is of considerable value and convenience. For instance, in a condenser, say, for marine purposes it is very desirable that when any bunch of plates requires to be removed from its casing for cleaning or repairs it should not be necessary to disconnect the casing from the adjoining parts and connections, and according to this invention the removal of such a bunch of plates can be effected without disturbing the connections, and, if so desired, another bunch of plates composing a passaged structure can be substituted by the simple removal of a part of the casing, which can immediately be replaced when another bunch has been substituted, and so permit of practically a continuous working of the apparatus.

The invention will now be described with reference to the example of construction shown in the accompanying drawings, whereon—

Figure 1 is a transverse vertical section of the casing, showing a bunch of plates in position, a portion of the latter being broken away in order to show one of the corrugated or indented plates. Fig. 2 is a similar view, a frame and cover, hereinafter described, having been removed and the bunch of plates shown also partly removed from the casing. Fig. 3 is a sectional side elevation. Fig. 4 is a transverse vertical section intended to illustrate a frame in the casing which separates the bunches of plates, the example illustrated being a casing intended to contain a plurality of bunches. Fig. 5 is a similar view to Fig. 4, showing some of the composing parts separated; and Figs. 6 and 7 show, respectively, an elevation and a plan of the apparatus drawn to a smaller scale than the previous figures.

In such a casing, in which it is necessary to provide four separate conduits, it will be readily understood that if such conduits which are to be respectively connected with the inlet and outlet pipes for exhaust-steam and for cooling-water are constructed one immediately upon each side of the casing, as heretofore, that it is

then necessary to disconnect at least one of such tubular connections before a bunch of plates could be removed. Now in the construction shown in the accompanying drawings and according to this invention three
 5 sides of the casing only are directly occupied by such conduits, the fourth side being fitted with frames and covers, any frame and cover being capable of removal to permit of the
 10 withdrawal of a bunch of plates.

Referring to the drawings, 1 is a channel-section side of the casing, forming a conduit extending along one side of the same and formed at its end with a tubular connection 2,
 15 through which (considering the apparatus as a steam-condenser) the cooling-water is admitted, and the tubular connection 2 is attached to a pipe by which the water is admitted. The water so admitted by the con-
 20 duit 1 passes through the alternate chambers formed by the corrugated or indented plates and passing out from thence enters a chamber 3 upon the other side, this chamber being formed by lateral extensions of the upper and
 25 lower members of the casing and by a removable end plate 4.

The upper member of the casing forms a conduit 5, Fig. 6, inclined upward from its ends and having a tubular connection 6, Fig.
 30 1, by which exhaust-steam is admitted and passes through the alternate chambers in the bunches of plates, finding its exit by the conduit 8 and tubular connections 7, forming the lower surface of the casing. Both the upper
 35 and lower members 5 and 8 are formed with lateral-extending parts 9 10, and skeleton distance-frames 11 are provided, (see particularly Fig. 5,) to which the members 1, 5, and 8 are connected, and these skeleton distance-
 40 pieces have each a laterally-extending part which takes between the lateral extensions 9 and 10 of the members 5 and 8. Each skeleton frame 11 is formed with a contact-surface 13, and a bunch of plates is slid between two
 45 of such distance-pieces, so that its external edges contact with the surface 13.

Upon the side of the conduit 5 forming the upper member of the casing is a passage-way 14, and openings 15 are provided in the
 50 lateral extension 9 of the conduit 5, by which the cooling-water passes from the ends of the alternate chambers of the plates by the chamber 3 to the passage-way 14, and the passage-way 14, as shown at Fig. 7, has a tubular con-
 55 nection 16, which is attached to the pipe by which the cooling-water is taken off.

Referring to Figs. 1, 2, and 3, which show the parts composing the casing assembled, the spaces between the skeleton distance-pieces
 60 are each occupied by a rectangular distance-piece 17, which is shown separated at Fig. 5 and *in situ* at Figs. 1 and 3, and the inner face of this frame may be fitted, as shown at Fig. 1, with any suitable packing 18, let into

a groove and which contacts with the edges of the bunch of plates, while the said rectangular frame 17 is formed on its outer face 19 with a flange to receive an end cover-plate 4, and the inner surface of the flange 19 contacts with the end surfaces of the lateral extensions
 70 9 and 10 and with the outer edges of the lateral extensions 12 of the skeleton distance-pieces 11. Several separate parts, as described, are bolted together in the position shown at Fig. 1.

The particular mode of building up and connecting the bunches of plates does not form the subject-matter of this invention; but so far as such bunches are illustrated in the drawings they consist of a number of corru-
 80 gated plates 20, placed surface to surface, with the corrugations of one plate extending in diverse directions to the corrugations of the next plate. The plain margins of the plates are so arranged that the interspaces at
 85 the edges between two plates are closed at the sides and open at the ends, while the interspaces between one of such plates and the next adjacent plate are closed at the ends and open at the sides, and then rigid clamping-
 90 plates (marked 21 in the drawings) are placed upon each end plate 20 of a bunch and drawn together by bolts 22, and such a construction has been described in the specification of my
 95 patent application, Serial No. 255,090, filed April 12, 1905.

As is sufficiently illustrated in the example shown, each bunch of plates 20 is rectangular, and the surfaces of the external end clamping-plates 21 of each bunch which are
 100 to contact with the surfaces 13 of the skeleton distance-pieces 11 may be slightly tapered, so that when a bunch of plates is slid into position in the casing a good surface contact with the said distance-pieces 11 will be
 105 easily produced.

Obviously those distance pieces or frames (similar to the skeleton distance-pieces 11) which come at the ends of the casing are
 110 made solid, so as to form an end closure.

In the example of construction shown the casing is so placed that the bunches of plates are slid into or withdrawn from the same in a lateral direction, and such is a construction which may suit certain circumstances and
 115 particularly when each bunch of plates is of comparatively small size; but it should be understood that when the said bunches of plates are of large size then the cover-plates 4 will be arranged at the top, so that the
 120 bunches of plates may be drawn out in a vertical direction, and when so placed and it is required to remove a bunch of plates a cover-plate 4 is removed, the rectangular frame 17 immediately beneath the same is drawn out,
 125 and the bunch of plates 20 can then be raised from its seatings by means of a crane or other hoisting-tackle.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In surface heating or cooling apparatus; the combination with a structure having passages extending through same from side to side for the passage of one medium, alternating with adjacent passages extending through the structure for the passage of the other medium; of a casing for containing said structure, a first wall to the casing having a conduit formed therein extending the length thereof to communicate with all the end-to-end passages in said structure to admit the first medium thereto, a second wall having a conduit formed therein for exit of the first medium, a third wall having a conduit formed therein to communicate with all the side-to-side passages of the structure to admit the second medium thereto, lateral extensions of the first and second walls beyond the contained structure to form a lateral chamber communicating with the exit ends of all the side-to-side passages of said structure and through which chamber the latter is inserted and withdrawn, means for retaining the said structure in position in the casing, a removable cover-plate for closing the face of the lateral chamber, and an exit-conduit on one wall of the lateral chamber having openings communicating with the latter for conveying the medium therefrom.

2. In surface heating or cooling apparatus; the combination with a plurality of structures, each having adjacent passages extending through same in opposite directions for the passage of the two mediums; of a casing for containing said structures, a first wall to the casing having a conduit formed therein to communicate with all the end-to-end passages in said structures to admit the first medium thereto, a second wall having a conduit formed therein for exit of the first medium, a third wall having a conduit formed therein to communicate with all the side-to-side passages of the structures to admit the second medium thereto, lateral extensions of the first and second walls beyond the contained structures to form a lateral chamber communicating with the exit ends of all the side-to-side passages of said structures and through which chamber the latter are inserted and withdrawn, means for retaining the said structures in position in the casing, removable cover-plates for closing the face of the lateral chamber, and an exit-conduit on one wall of the lateral chamber having openings communicating with the latter for conveying the medium therefrom.

3. In surface heating or cooling apparatus; the combination with a plurality of structures, each having adjacent passages extending through same in opposite directions for the passage of the two mediums; of a casing for containing said structures, a first wall to the

casing having a conduit formed therein to communicate with all the end-to-end passages in said structures to admit the first medium thereto, a second wall having a conduit formed therein for exit of the first medium, a third wall having a conduit formed therein to communicate with all the side-to-side passages of the structures to admit the second medium thereto, lateral extensions of the first and second walls beyond the contained structures to form a lateral chamber communicating with the exit ends of all the side-to-side passages of said structures and through which chamber the latter are inserted and withdrawn, skeleton distance-frames fixed in the casing between the structures and extending to the outer face of the lateral chamber, bearing-surfaces formed on the sides of said frames with which the edges of said structures contact, means for retaining the said structures in position in the casing, removable cover-plates for closing the face of the lateral chamber, and an exit-conduit on one wall of the lateral chamber having openings communicating with the latter for conveying the medium therefrom.

4. In surface heating or cooling apparatus; the combination with a plurality of structures, each having adjacent passages extending through same in opposite directions for the passage of the two mediums; of a casing for containing said structures, a first wall to the casing having a conduit formed therein to communicate with all the end-to-end passages in said structures to admit the first medium thereto, a second wall having a conduit formed therein for exit of the first medium, a third wall having a conduit formed therein to communicate with all the side-to-side passages of the structures to admit the second medium thereto, lateral extensions of the first and second walls beyond the contained structures to form a lateral chamber communicating with the exit ends of all the side-to-side passages of said structures and through which chamber the latter are inserted and withdrawn, skeleton distance-frames fixed in the casing between the structures and extending to the outer face of the lateral chamber, bearing-surfaces formed on the sides of said frames with which the edges of said structures contact, a removable rectangular distance-piece 17, fitted in the extension-chamber between each two skeleton distance-pieces, a bearing-surface around the inner face of each distance-piece to contact with the edges of each contained structure, a flange around the outer face of same, and means for detachably securing the said flange to the outer edges of the lateral extensions of the first and second walls and to the outer edges of the skeleton distance-frames, removable cover-plates for closing the face of the lateral chamber, and an exit-conduit on one wall of the lateral chamber having open-

ings communicating with the latter for conveying the medium therefrom.

5. In surface heating or cooling apparatus; the combination with a plurality of structures
 5 each composed of indented or corrugated plates arranged surface to surface in contact or nearly so with the alternate edges of said plates connected to form a series of adjacent passages extending in parallel planes, pre-
 10 senting through passages in opposite directions between said plates for the passage in one direction for one medium and the passage in the other direction for the other medium; of a casing for containing said structures; a
 15 first wall to the casing having a conduit formed therein to communicate with all the end-to-end passages in said structures to admit the first medium thereto, a second wall having a conduit formed therein for exit of the first me-
 20 dium, a third wall having a conduit formed therein to communicate with all the side-to-side passages of the structures to admit the second medium thereto, lateral extensions of the first and second walls beyond the con-
 25 tained structures to form a lateral chamber communicating with the exit ends of all the side-to-side passages of said structures and through which chamber the latter are inserted and withdrawn, skeleton distance-frames fixed
 30 in the casing between the structures and extending to the outer face of the lateral chamber, bearing-surfaces formed on the sides of said frames with which the edges of said structures contact, a removable rectangular
 35 distance-piece 17, fitted in the extension-chamber between each two skeleton distance-pieces, a bearing-surface around the inner face of each distance-piece to contact with the edges of each contained structure, a flange
 40 around the outer face of same, and means for detachably securing the said flange to the outer edges of the lateral extensions of the first and second walls and to the outer edges of the skeleton distance-frames, removable
 45 cover-plates for closing the face of the lateral chamber, and an exit-conduit on one wall of the lateral chamber having openings com-

municating with the latter for conveying the medium therefrom.

6. In surface heating or cooling apparatus; 50 the combination with a plurality of structures each composed of a number of indented or corrugated plates secured together surface to surface in contact or nearly so to form a bunch, having the interspaces at the side 55 edges between the adjacent plates closed and the end edges open, and the interspaces between the side edges of one of such plates and the next adjacent plate open and the end edges closed, and so on; of a casing for containing 60 said structures, a first wall to the casing having a conduit formed therein to communicate with all the end-to-end passages in said structures to admit the first medium thereto, a second wall having a conduit formed therein 65 for exit of the first medium, a third wall having a conduit formed therein to communicate with all the side-to-side passages of the structures to admit the second medium thereto, lateral extensions of the first and second 70 walls beyond the contained structures to form a lateral chamber communicating with the exit ends of all the side-to-side passages of structures and through which chamber the latter are inserted and withdrawn, skeleton 75 distance-frames fixed in the casing between the structures and extending to the outer face of the lateral chamber, bearing-surfaces formed on the sides of said frames with which the edges of said structures contact, means 80 for retaining the said structures in position in the casing, removable cover-plates for closing the face of the lateral chamber, and an exit-conduit on one wall of the lateral chamber having openings communicating with 85 the latter for conveying the medium therefrom.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ARTHUR WILFRED BREWTHALL.

Witnesses:

WALTER W. TAYLOR,
 ALFRED BOAZMAN.