

903,700.

J. E. FROST.  
STEAM AND HOT WATER HEATER.  
APPLICATION FILED FEB. 5, 1907.

Patented Nov. 10, 1908.

4 SHEETS—SHEET 1.

Fig. 1.

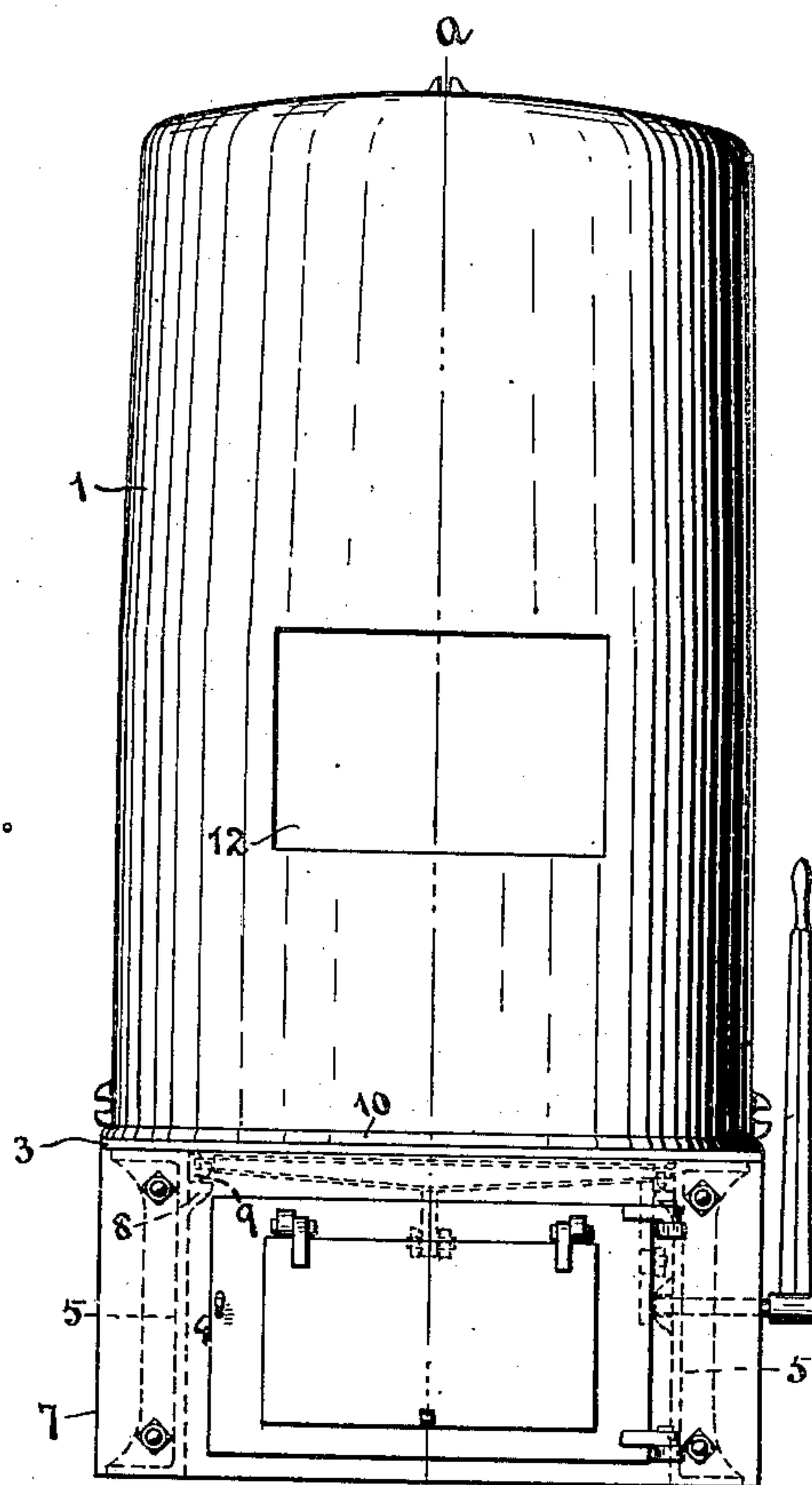


Fig. 2.

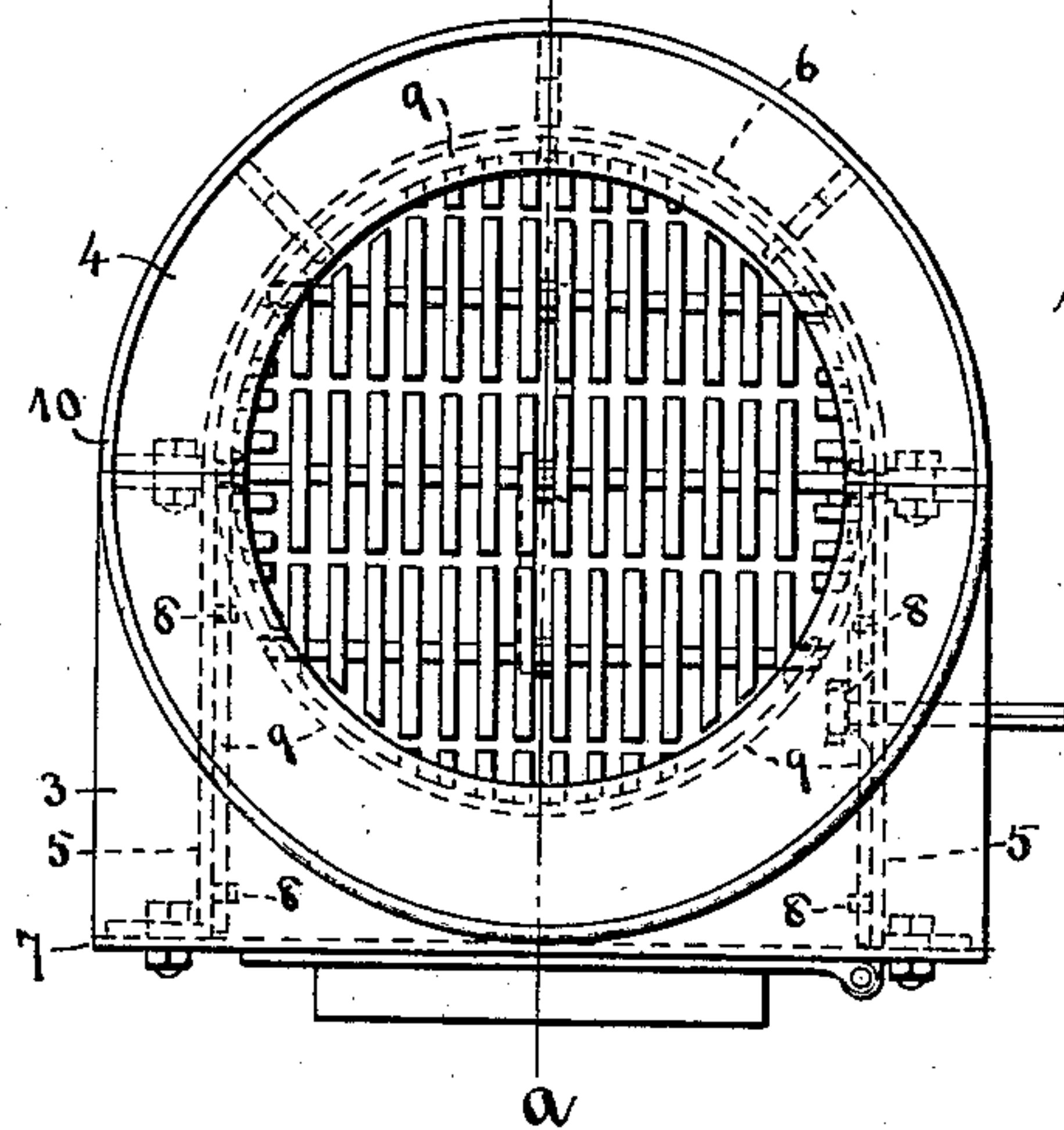
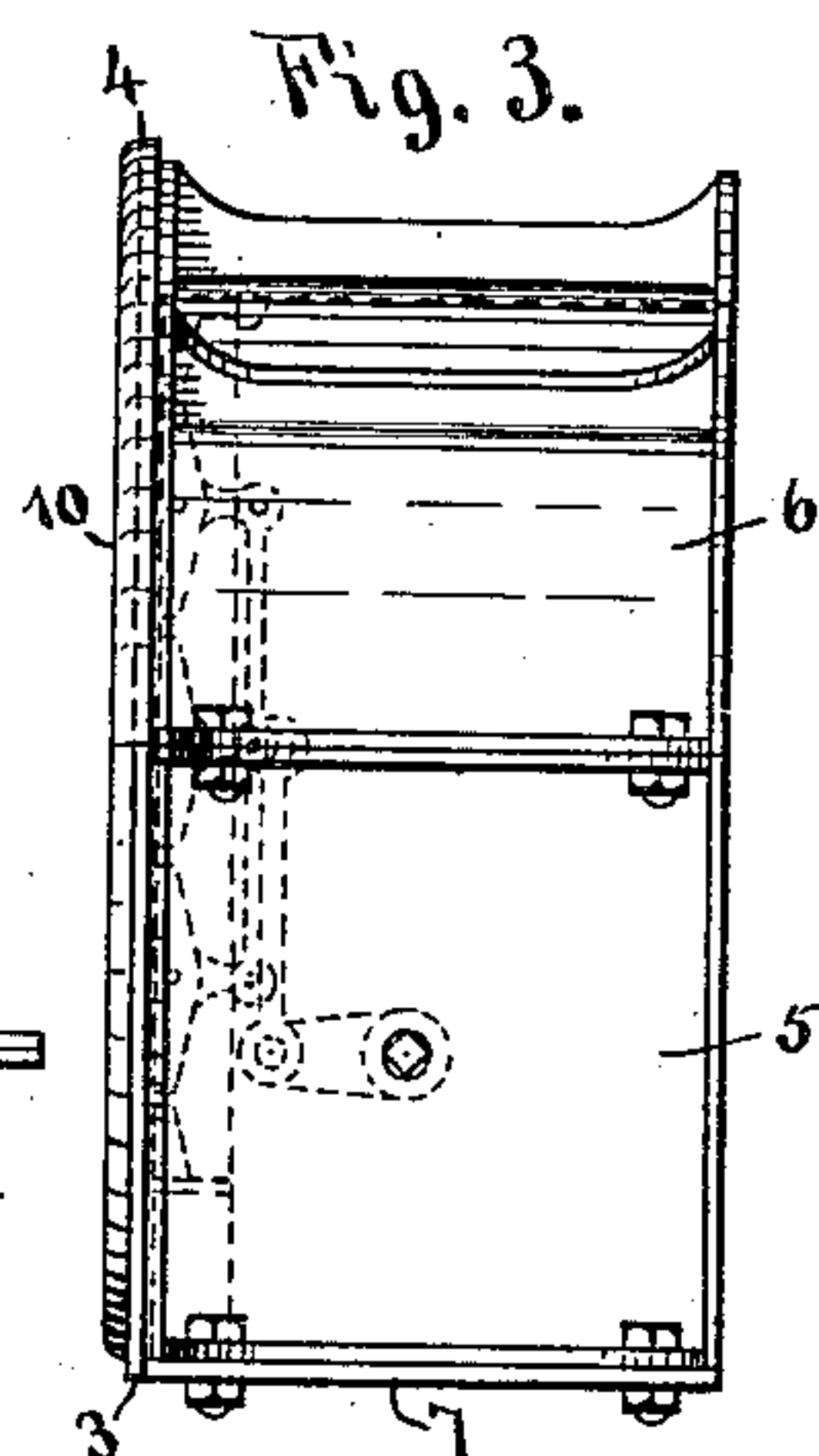


Fig. 3.



WITNESSES:

M. E. Verbeck.  
L. V. Koeltgen

INVENTOR

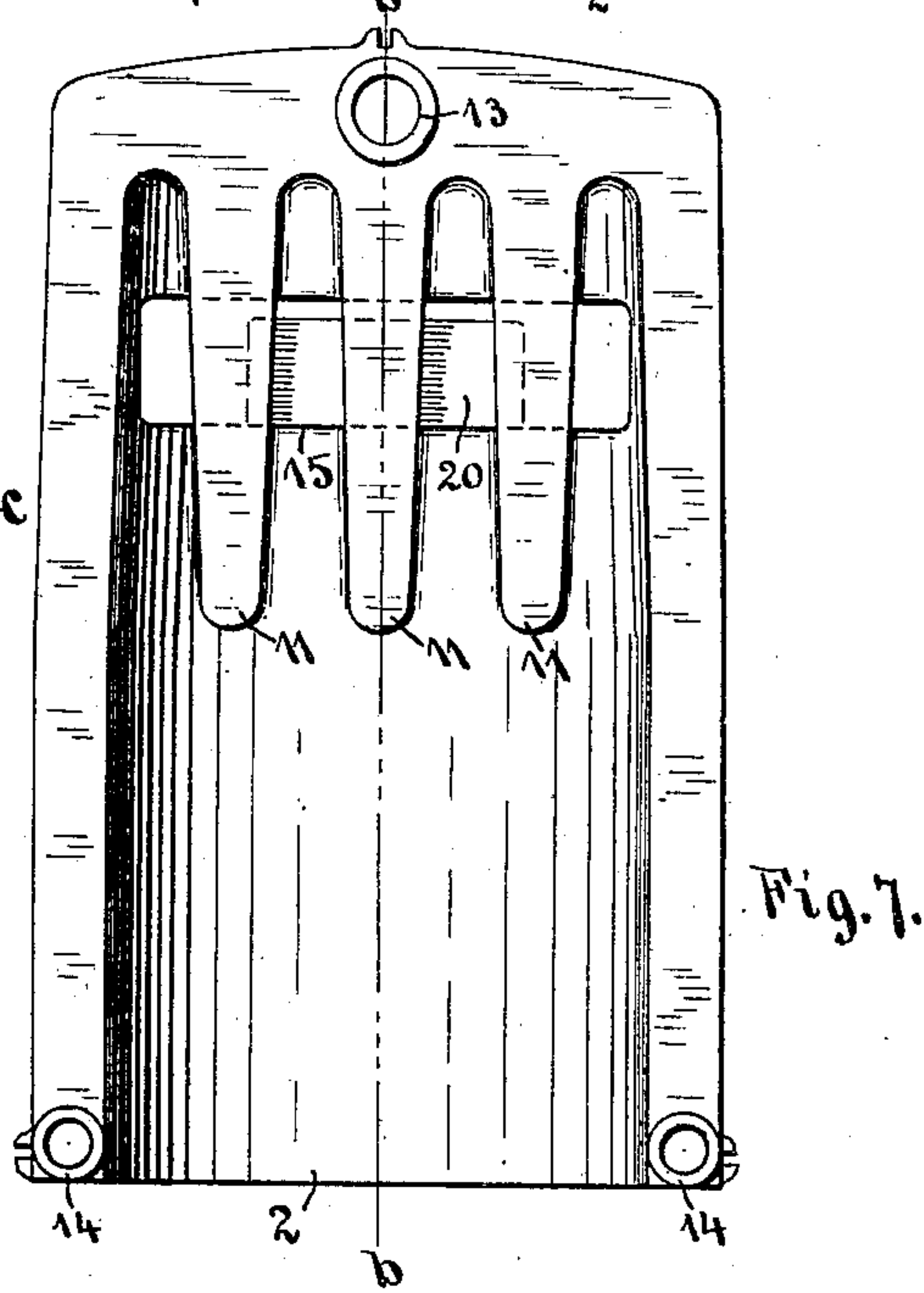
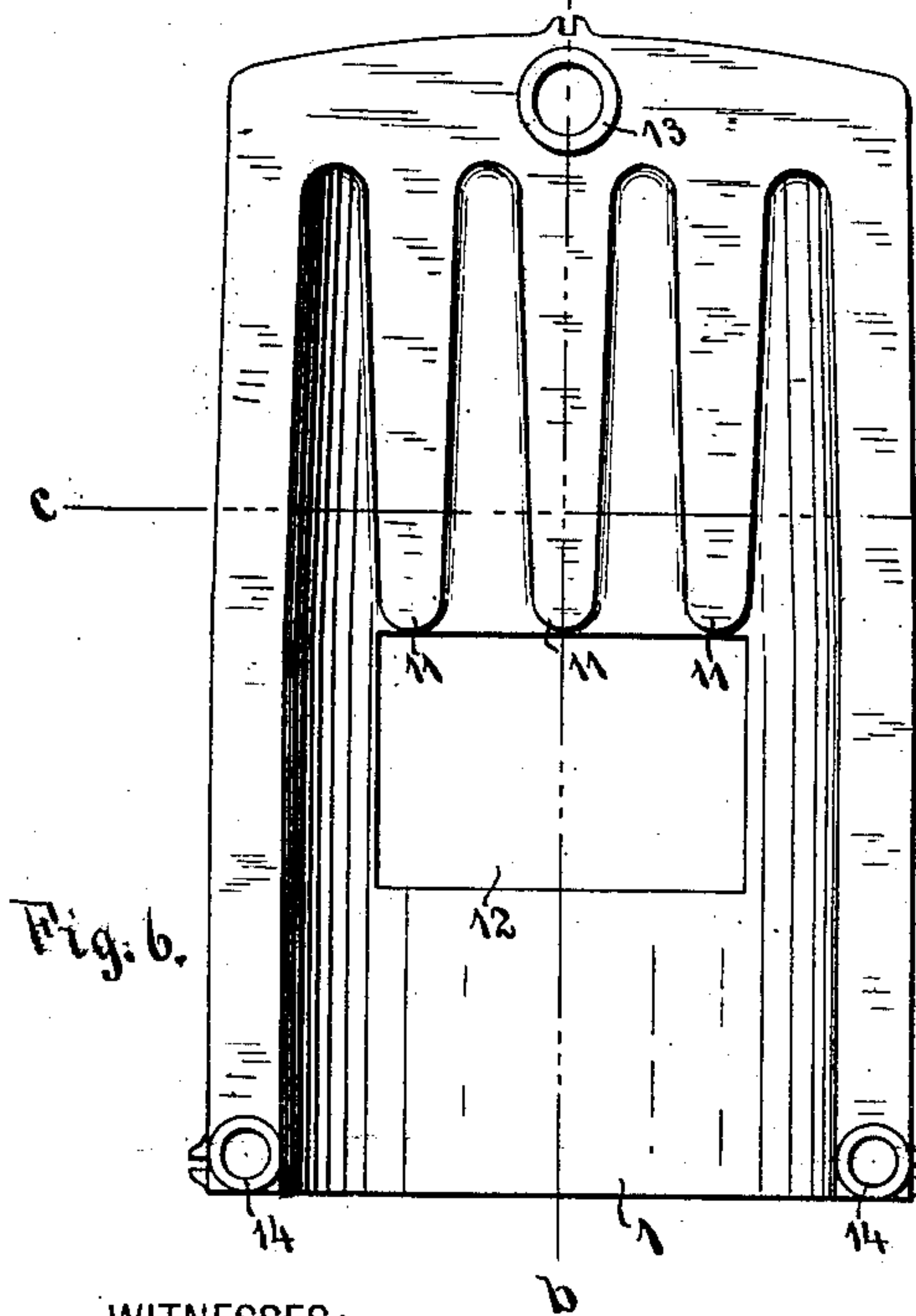
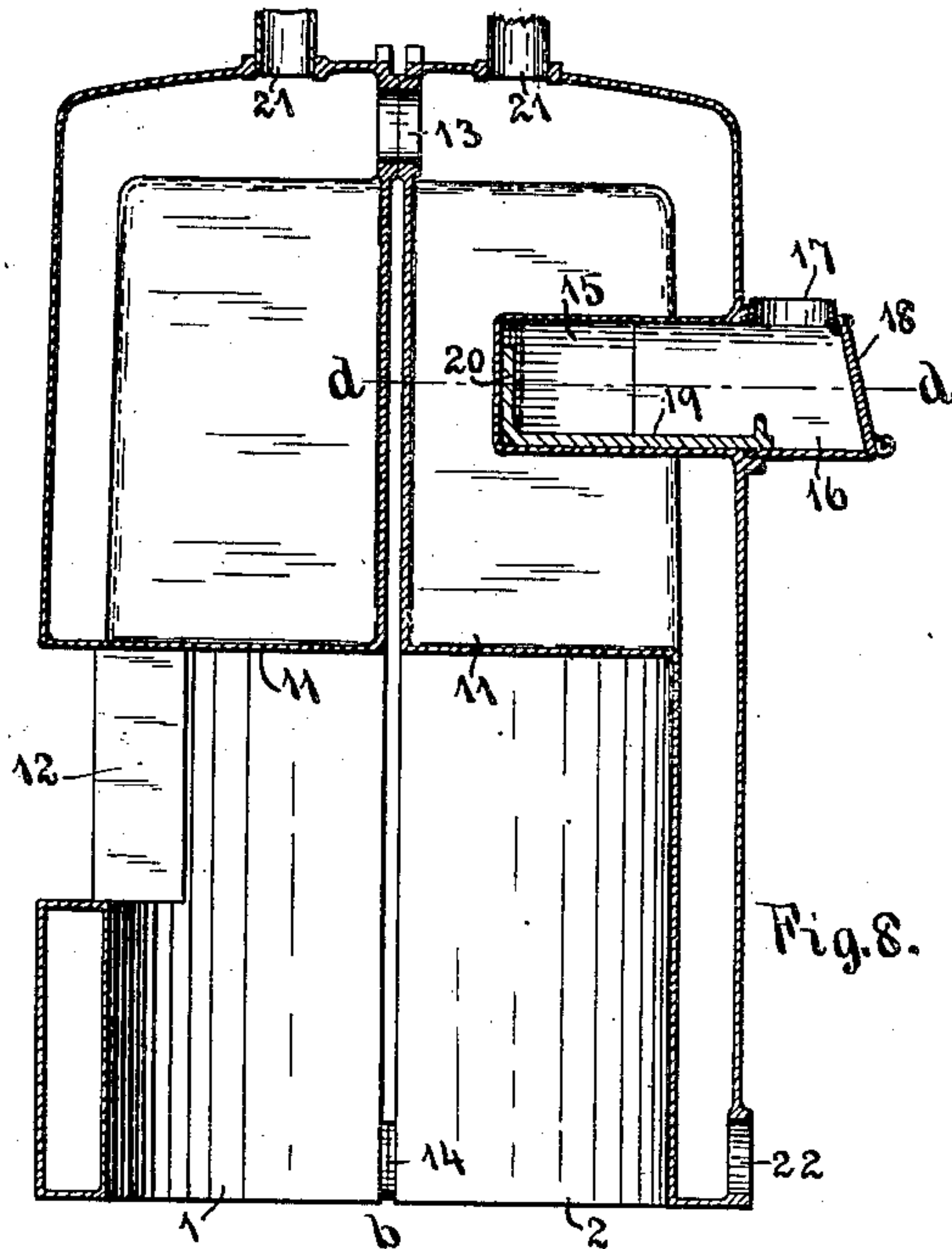
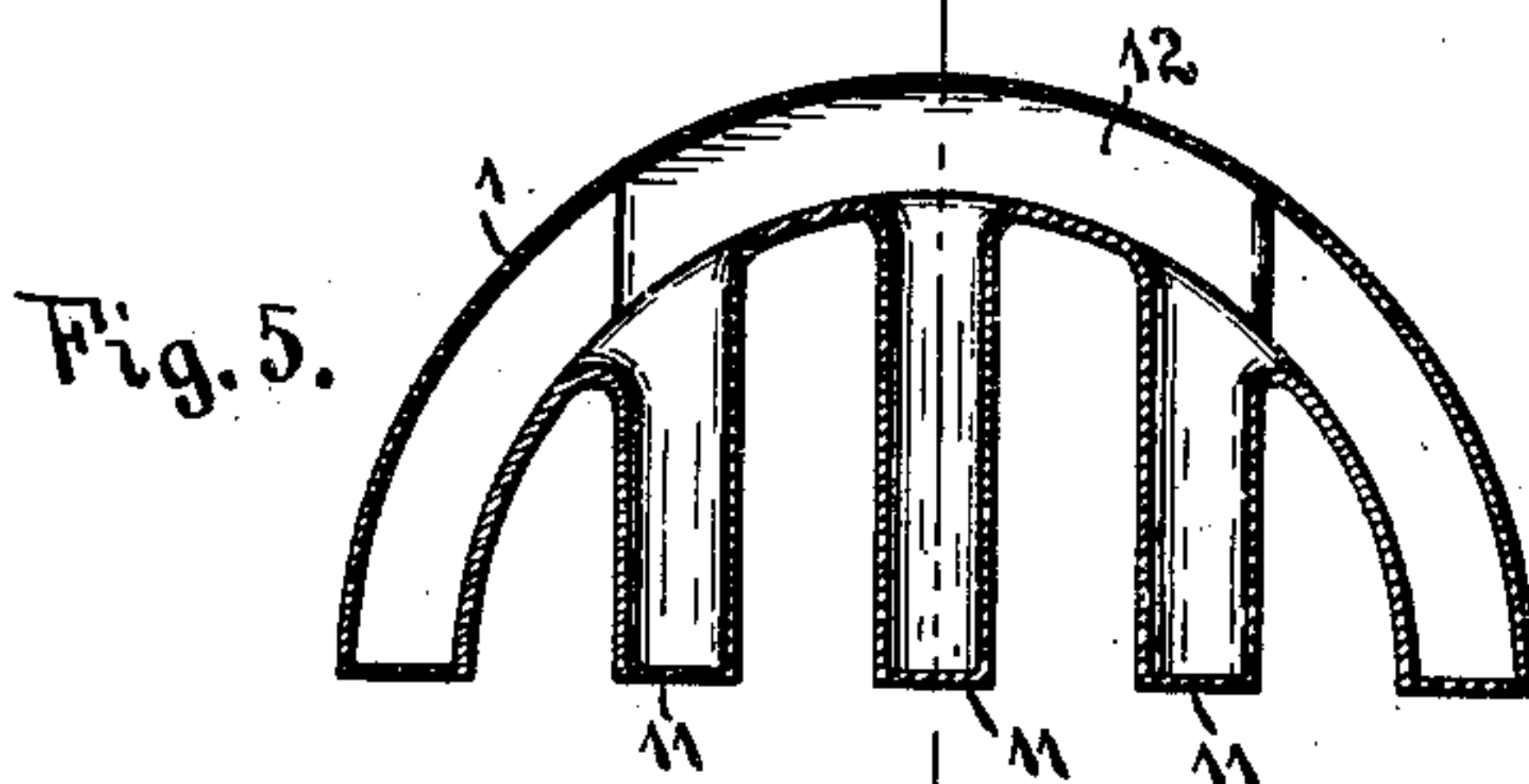
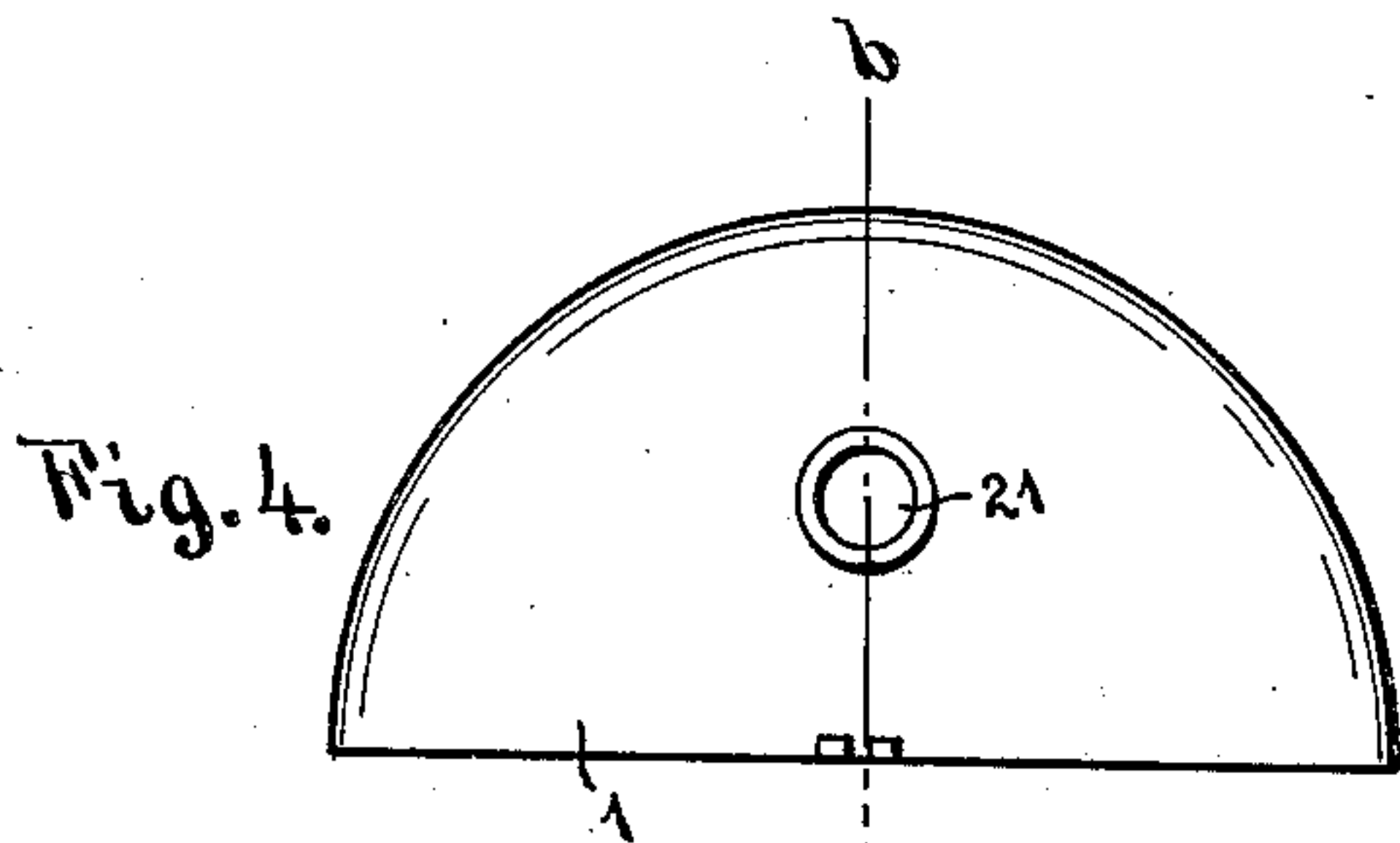
John E. Frost  
BY  
Eugene Diven  
ATTORNEY

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4 SHEETS—SHEET 2.



WITNESSES:

M. E. Verbeck.  
R. V. Stollgren

INVENTOR

John E. Frost  
BY  
Eugene Aiken  
ATTORNEY

J. E. FROST.  
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4 SHEETS—SHEET 3.

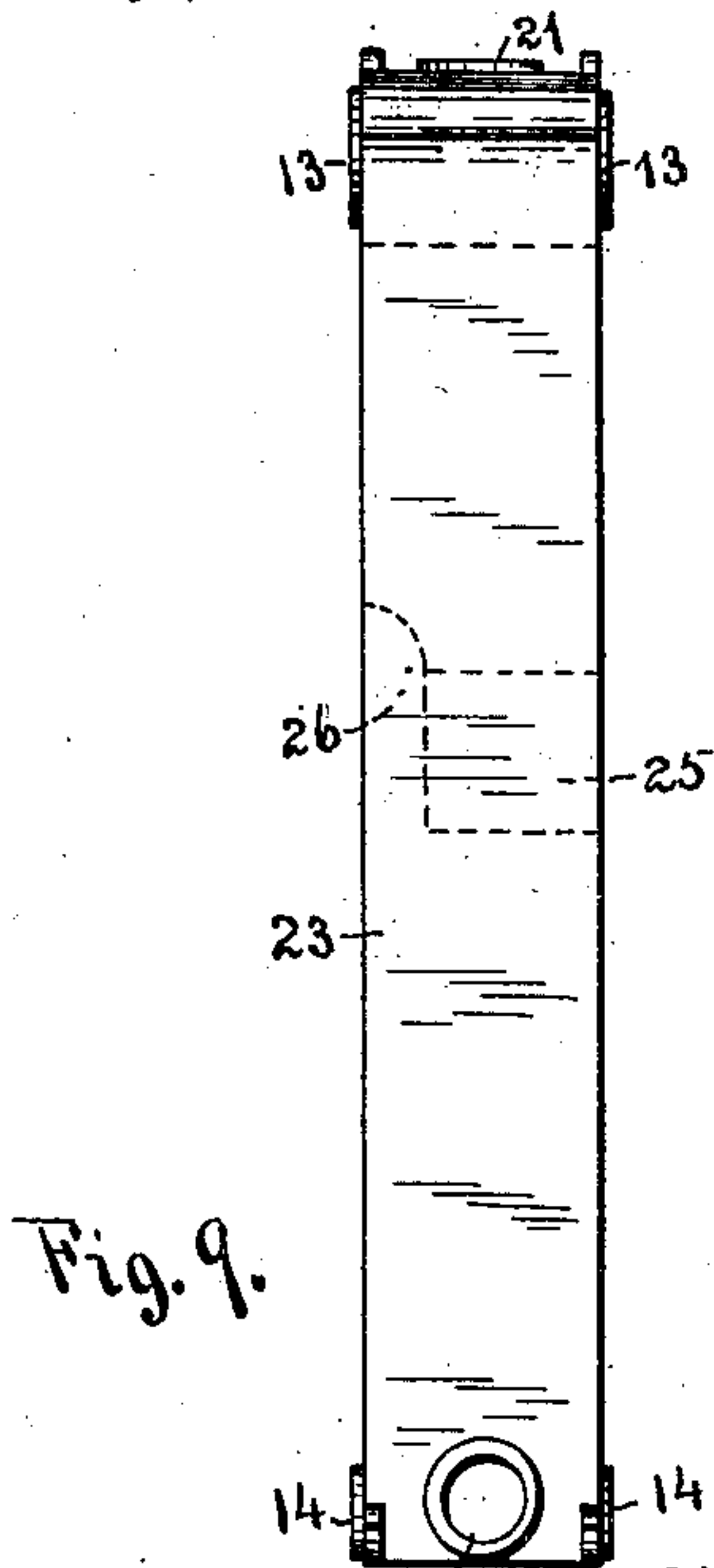


Fig. 9.

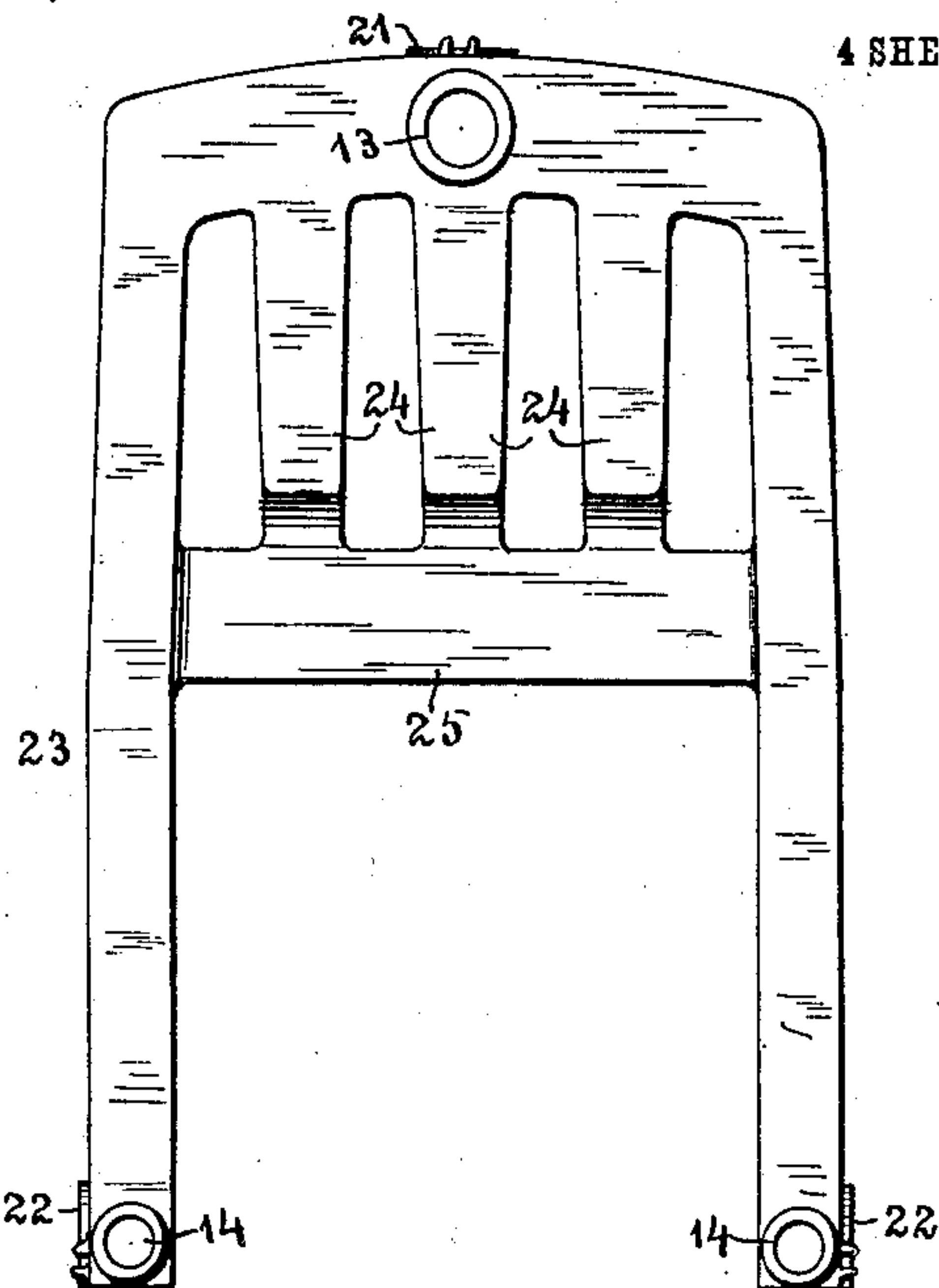


Fig. 10.

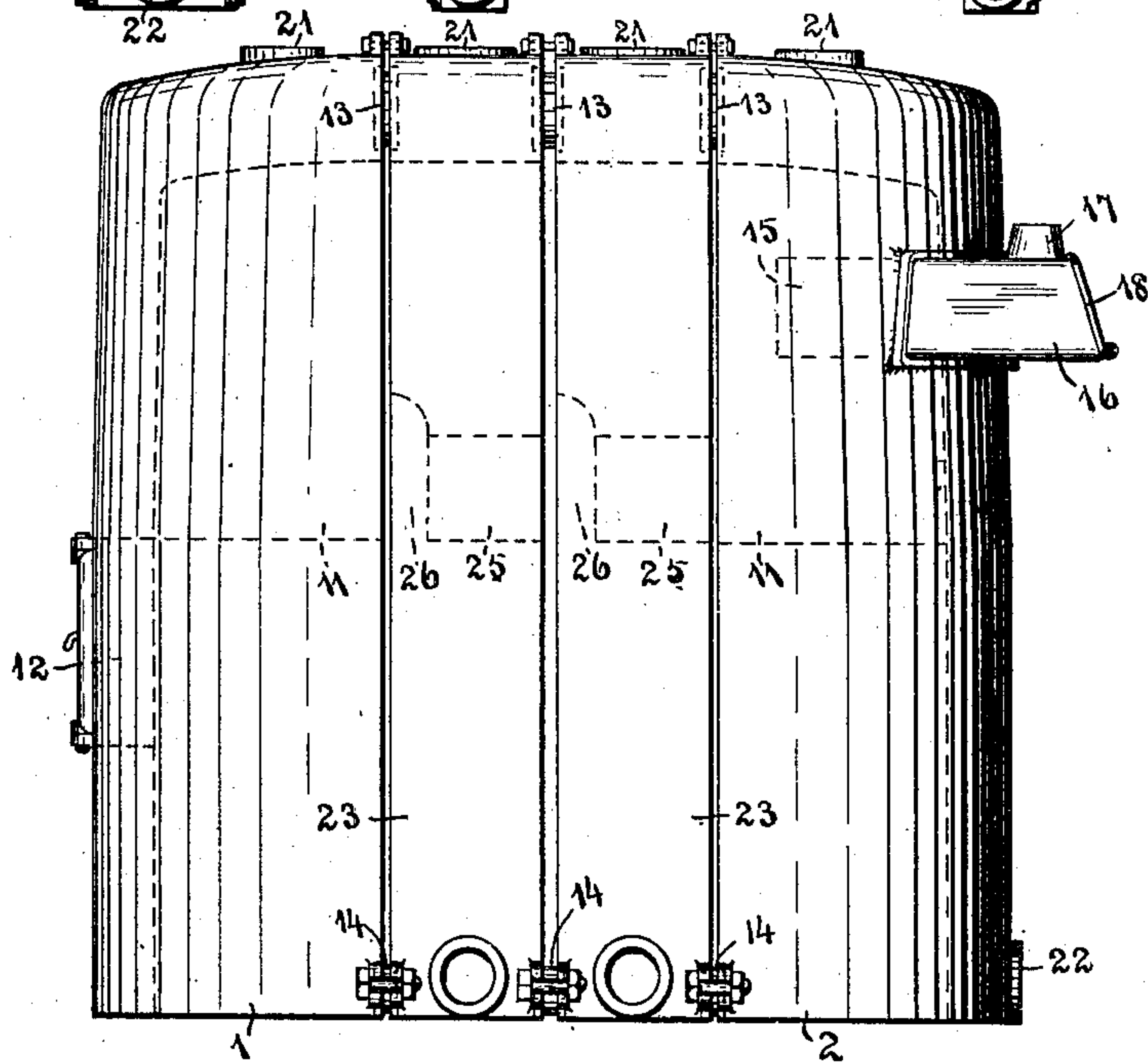


Fig. 11.

WITNESSES:

M. E. Verbeck.  
R. V. Stoelghin

INVENTOR

John E. Frost

BY

Eugene Dixon  
ATTORNEY.

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J. E. FROST.  
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4 SHEETS—SHEET 4.

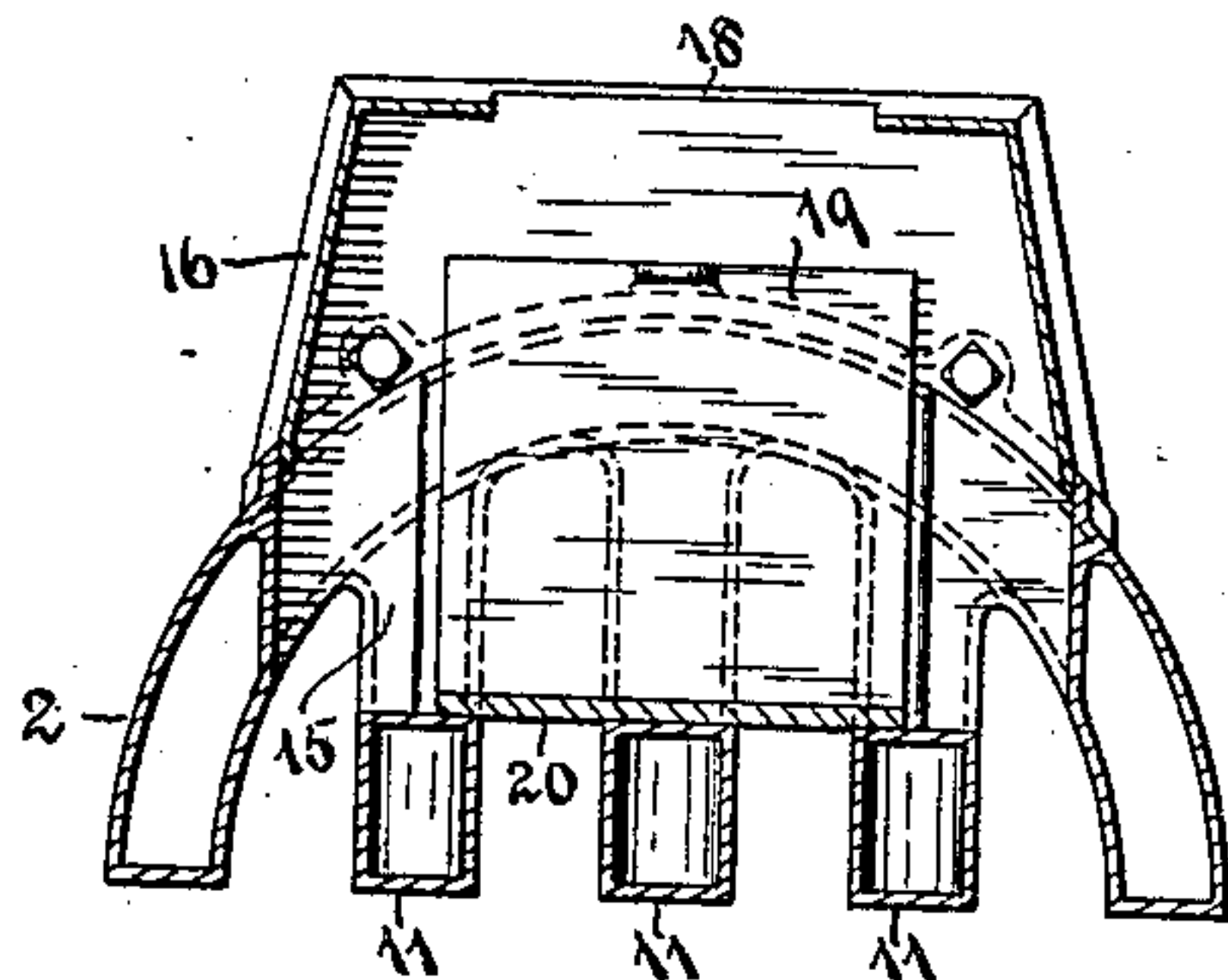


Fig. 12.

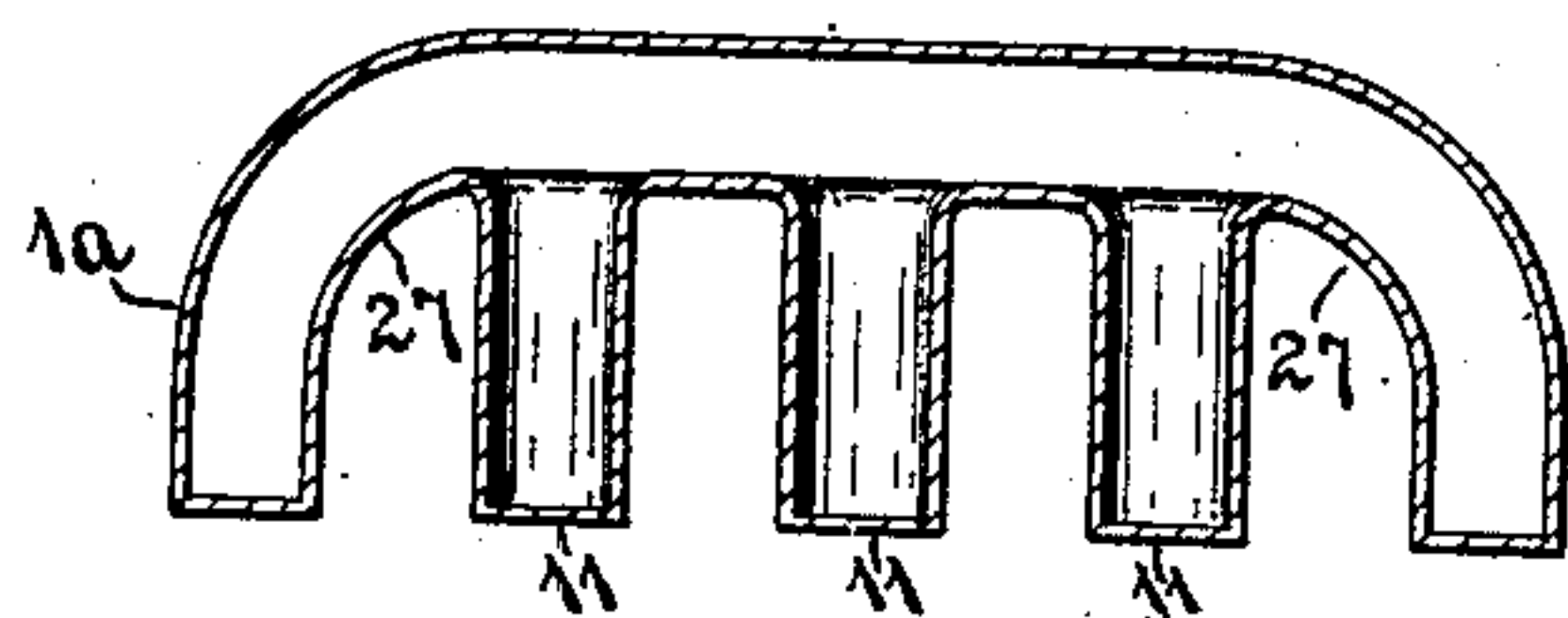


Fig. 13.

WITNESSES:

M. E. Verbeck.  
L. V. Stetson

INVENTOR  
John E. Frost  
BY  
Eugene Diven  
ATTORNEY



# UNITED STATES PATENT OFFICE.

JOHN E. FROST, OF WATKINS, NEW YORK.

## STEAM AND HOT-WATER HEATER.

No. 903,700.

Specification of Letters Patent.

Patented Nov. 10, 1908.

Application filed February 5, 1907. Serial No. 355,864.

*To all whom it may concern:*

Be it known that I, JOHN E. FROST, a citizen of the United States, residing at Watkins, in the county of Schuyler and State of New York, have invented certain new and useful Improvements in Steam and Hot-Water Heaters, of which the following is a specification.

This invention relates to improvements in vertical heaters of the round fire box type, such as are used in connection with steam or hot water heating systems.

The principal object of my invention is to construct the heater with front and back halves in separate parts and so formed as to provide a round cornered firebox wherein the heat will be applied to the surrounding water leg, and to water and steam spaces above the firebox, with the greatest possible efficiency.

A further object is to provide for increasing the capacity of the heater by separating the front and back halves and inserting between them one or more intermediate sections, thereby forming a sectional heater having a firebox of oval, or oblong form devoid of square corners. For heaters of the larger sizes, these front and back halves, or sections, may be flattened to provide for greater economy and convenience in construction, still retaining, however, the round corner principle. Heretofore heaters of the vertical sectional type have generally been made with the front and back sections shallow, and the firebox formed by them and the intermediate sections has been of oblong shape with square corners. These corners produce pockets in which the coal becomes chilled, it being almost impossible to get live coals into contact with the heater shell in these corners. The hottest fire is therefore concentrated near the center of the firebox, and out of contact with the remote corners, thus greatly reducing the heating efficiency of the fire as applied to the water surrounding it in the water legs. The gases also fail to circulate in these corner spaces above the firebox. To overcome this objectionable feature, I provide front and back sections of considerable depth, giving them a semi-cylindrical shape to form a two part round heater; or providing them with well defined rounded corners, where it is desirable that there shall be flat surfaces at the front and rear of the heater, as in the larger sizes of heaters, and where a number of intermediate

sections are inserted to extend and increase the capacity of the heater.

I further increase the efficiency of the heater by features of construction embodying pendent water spaces particularly arranged with that end in view, as will hereinafter be more particularly described and pointed out in the claims.

I attain my object by means of the arrangement and construction of the several parts of the heater as illustrated in the accompanying drawings, in which—

Figure 1 represents a front elevation of my improved heater and base; Fig. 2, a plan view of the base, showing the grate arrangement and the bed plates upon which the heater sections rest; Fig. 3, a side elevation of the base; Fig. 4, a plan view of the front section of the heater; Fig. 5, a transverse section of the same on lines *c—c* in Fig. 6; Fig. 6, an elevation of the front of said section looking from the inside; Fig. 7, a similar elevation of the back section; Fig. 8, a vertical transverse section of the heater comprising front and back sections only, on the lines *a—a* and *b—b* in Figs. 1 to 7, respectively; Figs. 9 and 10, side and end elevations, respectively, of an intermediate section adapted to be used in connection with my improved front and back sections; Fig. 11, a side elevation showing the manner of assembling the sections of my heater, where intermediate sections are employed; Fig. 12, a transverse section of the back section on the line *d—d* in Fig. 8; and Fig. 13, a transverse section of a modified form for the front and back sections, where flat surfaces are to be presented at the front and rear of the heater.

Like numerals designate like parts in the several views.

In its simplest form, and where a comparatively small heater is required, as for an average house heating system, my heater will consist of two sections 1 and 2, of semi-cylindrical shape, coupled together in the usual manner by bolts at the top and sides, with the seam between sections calked with plastic asbestos or other suitable filling. The base upon which the heater will rest consists of cast iron bed-plates 3 and 4, supported upon sectional side-plates 5 and 6, inclosing the ashpit; the front of the base being closed by plate 7, provided with the usual ash door and draft damper. The side sections 5 are provided with lateral webs or



flanges at front and rear, to which the front-plate 7 and the back side-plate 6 are bolted. This back side-plate, as herein shown, is in one piece, but it may be made in two or more parts. The plates 3 and 4 rest upon horizontal flanges cast around the upper edges of the side-plates 5 and 6. At the inside, the plates 5 and 6 are provided with lugs at 8, upon which the grate frame 9 rests, said grate frame being inserted before the front-plate is set in place. Oscillating grate bars are mounted on the grate frame, and are coupled together and operated by a shaking bar at the side of the heater, in the manner outlined in Figs. 1 and 3. Instead of employing the circular back side-plates 6, I may form the back half of the base by means of side-plates similar to plates 5, and a straight back-plate similar to the front-plate 7, in which case the base-plate 4 will correspond with the plate 3; in other words, the back half of the base may be made the duplicate of the front half, thereby avoiding multiplicity of patterns and variety of castings. On the top surface the plates 3 and 4 are provided preferably with a narrow fillet 10, within which the lower ends of the heater sections are fitted. These sections 1 and 2, consist of vertical water spaces semi-annular in form, to inclose the firebox; said vertical water spaces opening at the top into transverse water or steam spaces, which form the dome or top of the heater. From these upper transverse spaces, a plurality of vertical water spaces 11, descend to a point in line with the top of the fire door, said pendent water spaces being also connected with the annular vertical water spaces. These pendent water spaces are preferably tapering in form, being narrower at the bottom than at the top, and they extend from the side walls to the division line between sections, thereby forming parallel flues for the gases of combustion running from the front to the back of the heater, into which the gases must rise before passing out of the heater. The front section is provided at 12 with a doorway which will be closed by the usual fire door. At 13 the sections are provided with openings whereby the upper water or steam spaces are connected by means of push nipples or other packing devices, when the sections are assembled; the water legs at the bottom being provided with similar connections at 14.

The back section is provided with an outlet chamber for the smoke and gases at 15, which projects into the pendent water spaces 11, as shown in Figs. 8 and 12, to provide a common outlet for the flues formed between said spaces, and at each side thereof. The smoke box 16 is fastened to the back of this section, and is provided with a smoke pipe connection 17 at the top, and with a check damper 18 at the back. Within the

chamber 15 I provide a sliding baffle plate 19, which covers the lower portion of the flues between the pendent water spaces 11, and which is provided at the inner end with a vertical portion 20, which rises to near the top of the chamber to nearly close the vertical outlets from said flues. When this baffle plate is in its innermost position, the bulk of the escaping gases is caused to pass out into the chamber 15 at each side of the pendent water spaces 11, a smaller part passing out from the central flues over the top of the vertical portion 20 of the baffle-plate, thereby producing indirect circulation, and forcing the gases to the top and sides of the heater. By drawing the plate 19 outwardly more or less, the escape of the gases will be made more free and direct from the central flues, as required when building a fire or forcing the draft.

The steam or water from the top of the heater will pass into the distributing pipes, or into a steam drum, by way of the outlets 21, and the feed water and return circulation will be connected to the bottom of the water legs by means of connection 22.

Where intermediate sections are required to increase the capacity of the boiler, without increasing the size of the front and back sections, I arrange these intermediate sections as illustrated in Figs. 9 and 10. Each of these intermediate sections 23 will be alike in every respect, being formed with vertical water legs connected at the top by a transverse water or steam space to correspond with the front and back sections. From the upper space, pendent water spaces 24 corresponding with the water spaces 11 are provided; the bottom ends of these water spaces 24, however, being connected together and with the water legs by means of a transverse water space 25, in order to provide for the necessary circulation. This transverse water space 25 is narrower than the width of the section at one or both sides, to provide a flue space as indicated at 26 for the rise of gases into the flues between the water spaces 24. The heater comprising sections as above described will be assembled as illustrated in Fig. 11, and connected together and with the circulating system of piping in the usual manner. To lengthen the base to receive these additional heater sections, the front and back side sections 5 and 6 will be separated, and narrow base sections, corresponding in width to the heater sections, will be inserted.

Instead of making the front and back sections semi-cylindrical, I may form them with their respective front and rear surfaces flattened, as illustrated in Fig. 13, in which form these sections 1<sup>a</sup> will have their vertical water spaces curved at each side, thereby providing well rounded corners on the inside of the firebox, as indicated at 27; the other



features of construction remaining precisely the same as heretofore described. By thus providing comparatively deep front and back sections with well rounded corners, I avoid pockets for dead fire, and render the heating surface around and above the firebox efficient at all times. The pendent water chambers, forming, as they do, continuous longitudinal flues for the gases in the upper portion of the heater, also serve to evenly distribute the heat throughout the heater and provide large and efficient heating surfaces, the circulation through said flues being controlled and regulated by the sliding baffle plate 19 and its upturned portion 20.

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

1. A steam or hot water heater comprising front and back sections having vertical water spaces extending around at each side of the sections to inclose a firebox, upper water or steam spaces in said sections into which said vertical spaces open, a plurality of registering water spaces in said sections depending from the upper spaces and communicating with both upper and side spaces, flues extending from the front to the back of the sections between said pendent spaces, and an outlet chamber into which said flues open, said chamber passing through the vertical water space in the back section below the upper water or steam space therein.

2. A steam or hot water heater comprising a plurality of vertical sections, each having vertical side water spaces and upper transverse water or steam spaces into which the side water spaces open, the side water spaces inclosing a fire box, a plurality of water spaces depending from the upper spaces and communicating with the side spaces, said pendent water spaces being arranged in longitudinal lines extending from front to rear of the heater above the fire box and abutting one against another throughout each line parallel separated flues formed between said spaces, and a common outlet chamber at one end into which said flues open.

3. In a steam or hot water heater of the vertical sectional type, an intermediate section having side water spaces, an upper transverse water or steam space into which the side spaces open at the top, a plurality of vertical water spaces in the upper portion of the section opening into said upper space, all of which spaces are of the same width across the section, and a lower transverse wa-

ter space by which the lower ends of said vertical spaces are connected with the side spaces, said lower space being narrower than the other spaces.

4. In a steam or hot water heater of the vertical sectional type, a back section having a continuous vertical water space passing around from side to side to inclose a portion of a firebox, an upper water or steam space into which the vertical water space opens, a plurality of water spaces depending from said upper space and opening into the vertical water space, flues extending from the front to the back of the section between said pendent spaces, and an outlet chamber into which said flues open, said chamber passing through the vertical water space at the back and extending part way into the pendent spaces.

5. In a steam or hot water heater of the vertical sectional type, a back section having a continuous vertical water space passing around from side to side to inclose a portion of a fire box, an upper water or steam space into which the vertical water space opens, a plurality of water spaces depending from said upper space and opening into the vertical water space, flues extending from the front to the back of the section between said pendent spaces, an outlet chamber into which said flues open, said chamber passing through the vertical water space at the back and extending part way into the pendent spaces, and an adjustable baffle plate resting upon the bottom of the chamber and adapted to close the openings from the central flues to the bottom and inner end of the chamber.

6. A steam or hot water heater of vertical cylindrical form having an annular water space to inclose a fire box, an upper transverse water or steam space into which the annular space opens, a plurality of pendent longitudinal abutting water spaces extending from front to rear of the heater above the firebox and communicating at the top with the upper space and at the ends with the annular space, separated longitudinal flues between said pendent spaces open to the firebox below, and a common outlet chamber into which said flues open.

In testimony whereof I have affixed my signature, in presence of two witnesses.

JOHN E. FROST.

Witnesses:

LEO V. STOELTZLEN,  
M. E. VERBECK.