

(No Model.)

2 Sheets—Sheet 1.

J. BOND.  
SECTIONAL BOILER.

No. 407,920.

Patented July 30, 1889.

Fig.1.

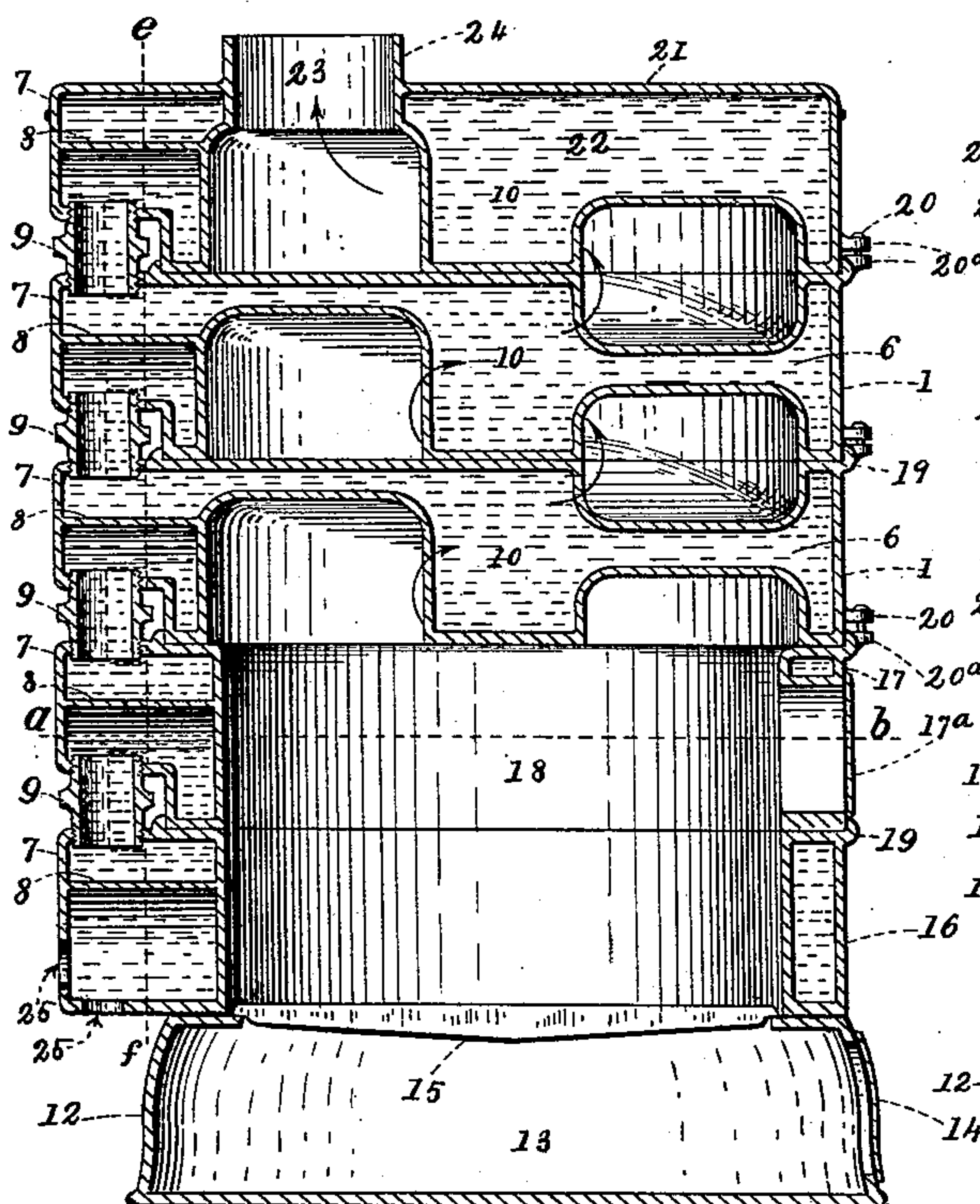


Fig.2.

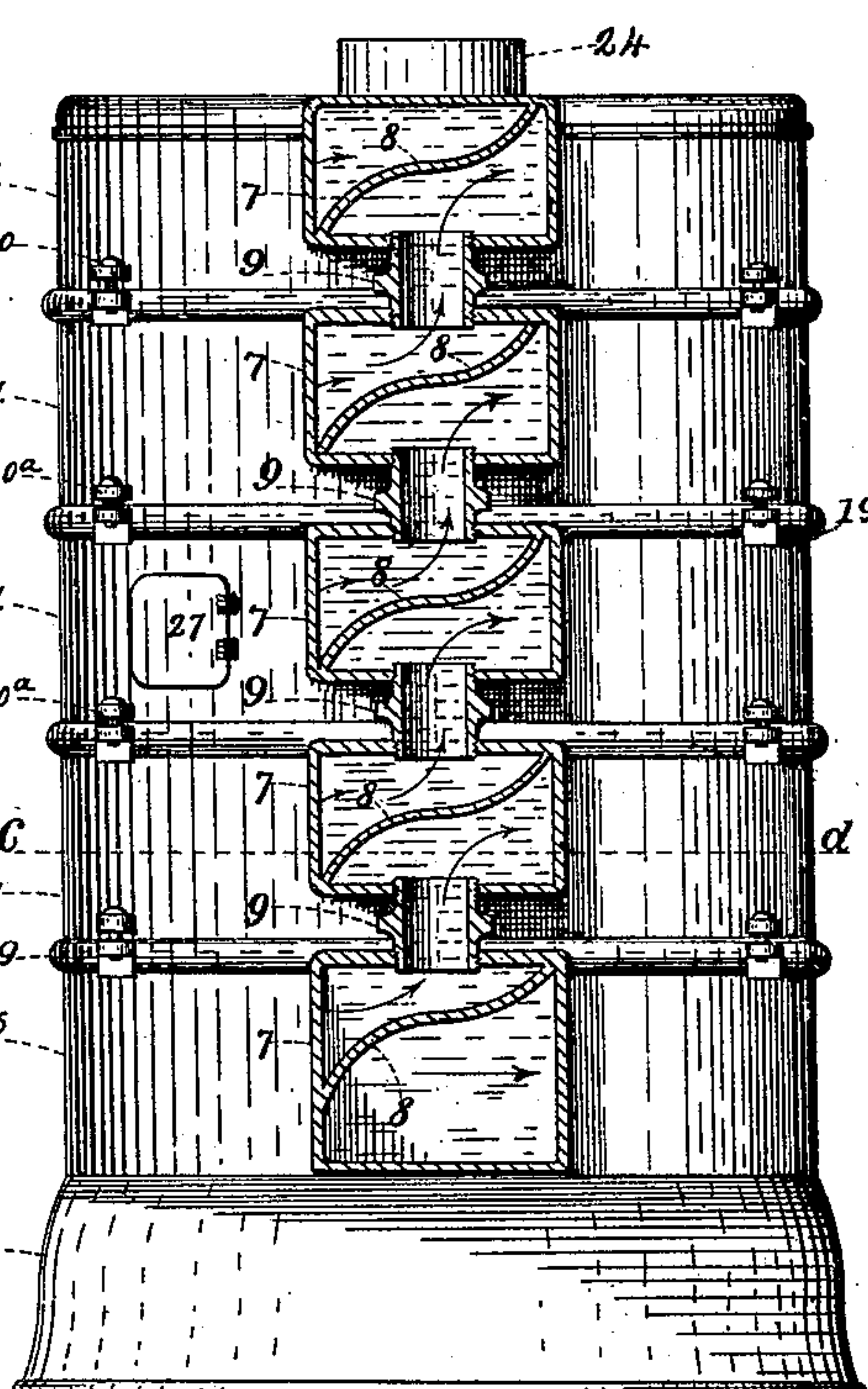


Fig.3.

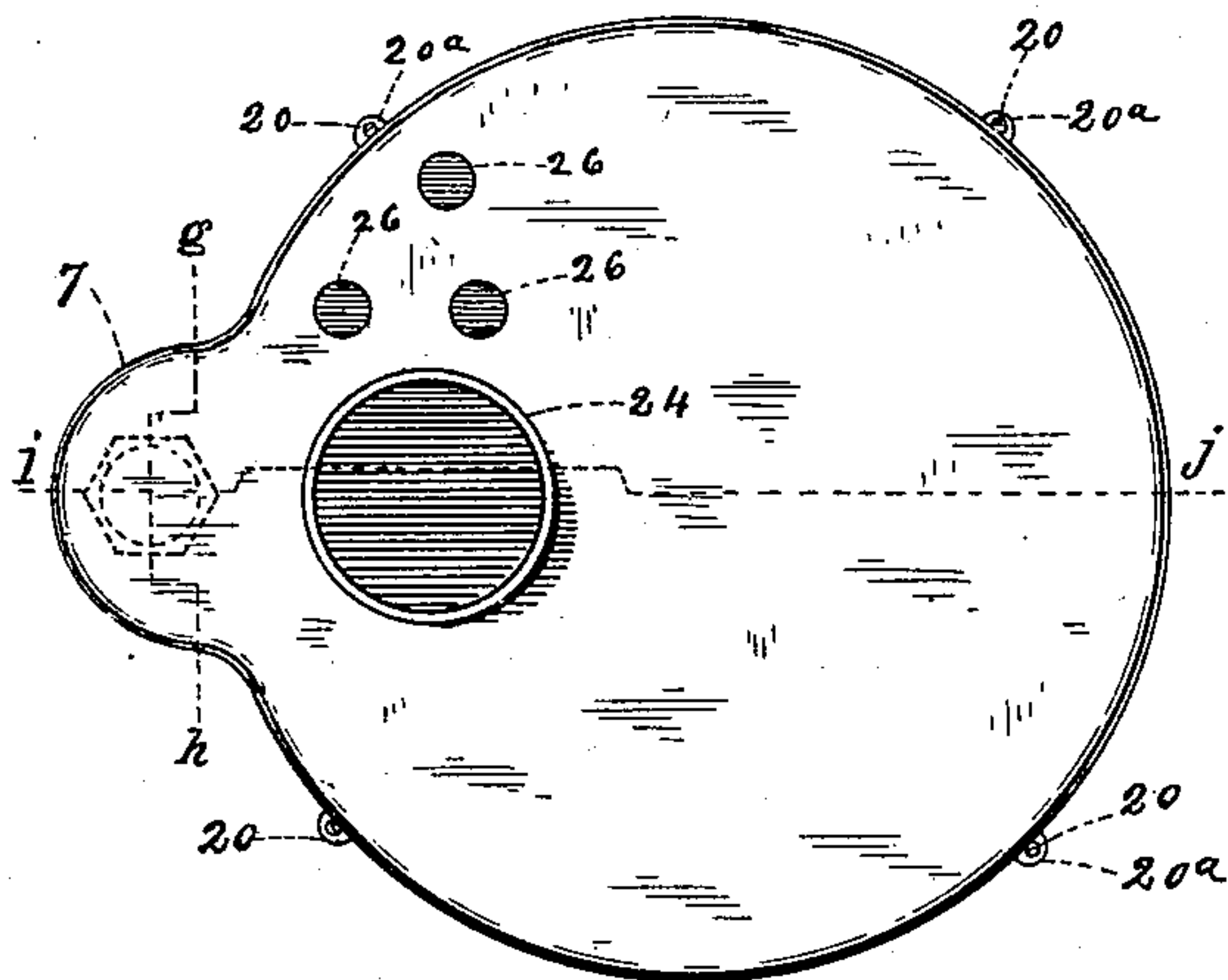
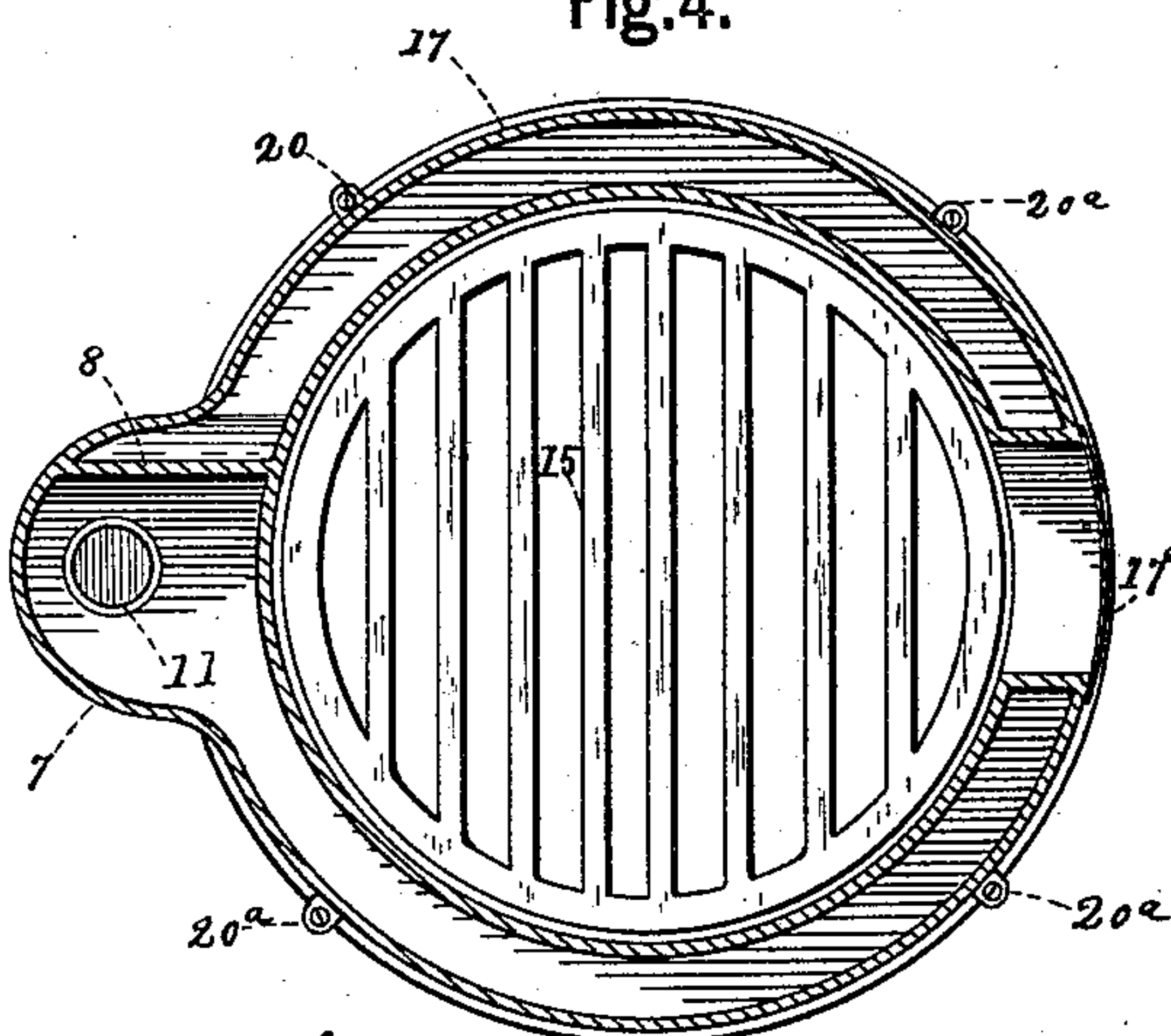


Fig.4.



Witnesses.

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By James Sangster,  
Attorney.

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Fig.5.

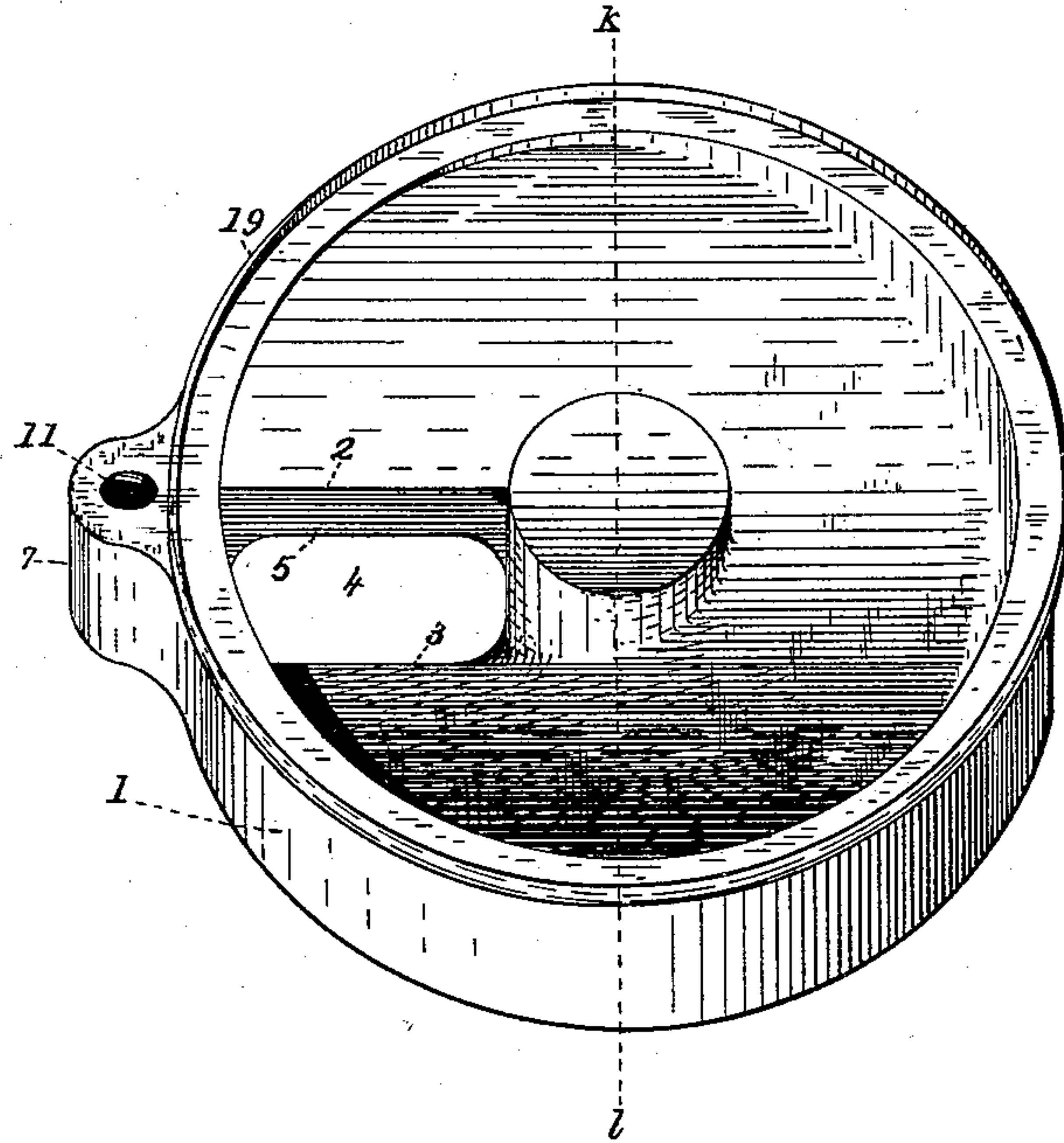
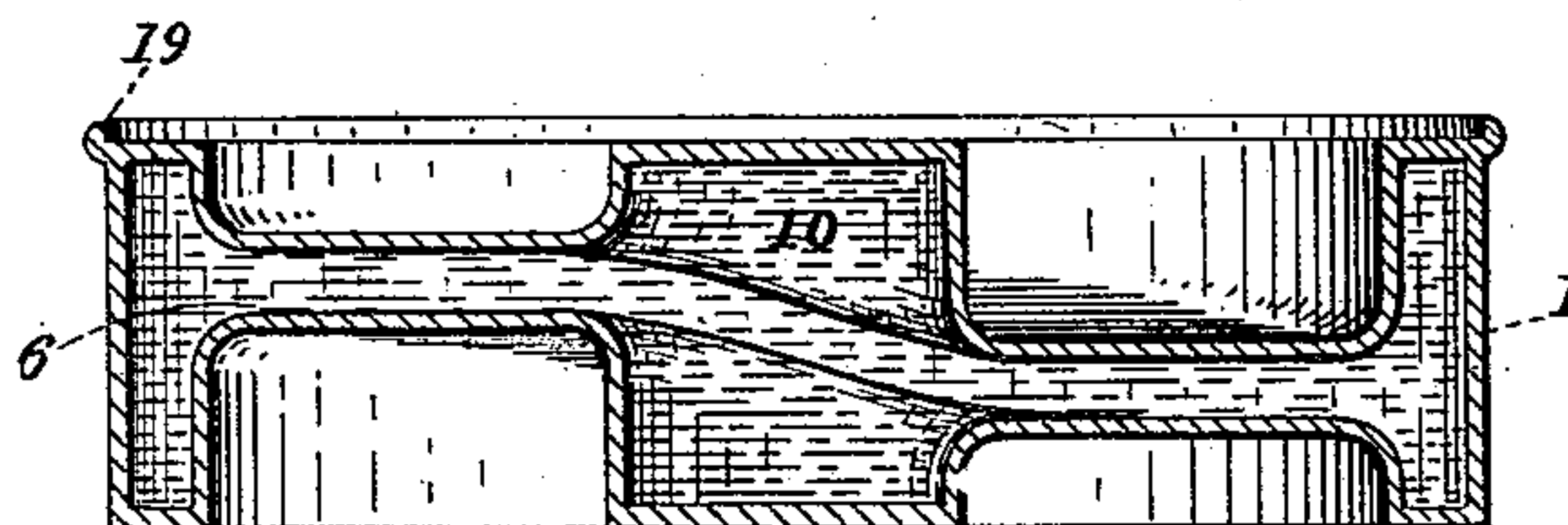


Fig.6.



**Witnesses.**

Witnesses.  
Arthur J. Sangster  
Chas. E. Keenow.

Joseph Bond, Inventor.

By James Sangster  
Attorney.



# UNITED STATES PATENT OFFICE.

JOSEPH BOND, OF BUFFALO, NEW YORK.

## SECTIONAL BOILER.

SPECIFICATION forming part of Letters Patent No. 407,920, dated July 30, 1889.

Application filed August 27, 1888. Serial No. 283,932. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH BOND, a citizen of the United States, residing in Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Sectional Boilers, of which the following is a specification.

My invention relates to certain new and useful improvements in sectional boilers; and it consists of a series of sections which, when secured together, form a spiral smoke-flue having an intermediate spiral water way or chamber, whereby an unobstructed spiral flue is provided for the products of combustion and a spiral passage-way within or between the spiral surfaces of the smoke-flue for the water to circulate through, all of which will be fully and clearly hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section through line *ij*, Fig. 3. Fig. 2 is a vertical cross-section on or about lines *ef* and *gh*, Figs. 1 and 3. Fig. 3 is a top plan view. Fig. 4 is a horizontal section in or about lines *ab* and *cd*, Figs. 1 and 2. Fig. 5 is a perspective view of a single section having the spiral water-passage and showing one-half of a portion of the spiral smoke-flue. Fig. 6 is a section through line *kl*, Fig. 5.

By reference to Fig. 5 it will be seen that the sections 1, forming the spiral passages, are each provided with an inclined spiral depression, commencing at the top at 2 and curving in an inclined direction toward the point 3, leaving an opening 4. This spiral depression forms one half of the smoke-flue; the other half is formed by the next section when placed above it. On the opposite half of the section is a similar depression placed parallel with the depression 2 3. These spiral depressions are each formed of metal of sufficient thickness to stand the required pressure, and are separated far enough apart from each other (for instance) from the point 2 to the point 5 to leave the required room between them for a spiral water-passage 6. Extending from each side or from one side of each casing is a smaller water-chamber case 7, projecting out from the main chamber and of less height than the section. It is provided with a diaphragm 8, running diagonally across it. (See Figs. 1, 2, and 4.) These extension portions

7 are made so as to extend only partly down the side of the section, so as to leave room enough to insert a screw-threaded tubular nipple 9, for producing a water-tight connection between the sections, as shown in Fig. 1.

The object of the projecting water-chamber portions 7 is to provide the means for a circulation of the water from one section up to or into another section; and the object of the diaphragms 8 is to compel the water as it enters the extension-chamber 7 at the lower side of the diaphragm to pass entirely around the section until it reaches the opposite side of the diaphragm before it passes up through the tubular-nipple connection into the section above it, when it makes another similar circuit in that section, and so on through as many sections as may be connected together.

The tubular nipples 9 are adapted to screw into holes 11 in the sections. (See Fig. 4.)

The base 12 of the boiler is provided with the ordinary ash-pit 13 and a door 14.

The grate 15 is made in the usual way. It represents the first fire-box section. It is provided with an annular surrounding water-chamber, an extension-chamber case 7, a diaphragm 8, and a screw-threaded tubular nipple having right-and-left-hand screws for connecting with the next fire-box section 17. This section 17 is also provided with a surrounding water-chamber, an extension-chamber case 7, a diaphragm 8, and a similar tubular screw-threaded nipple 9, for connecting it with the section above it, and a door 17<sup>a</sup>, opening into the fire-chamber. These fire-box sections inclose the combustion-chamber 18; but more of such sections may be used, according to the size of the combustion-chamber. There may also be more or less of the sections containing the spiral water-chambers and smoke-flues. The upper periphery of each section is provided with an upwardly-projecting flange 19, into which the lower edge of the section above is fitted. The rear portions of the sections are held together, and a water-tight joint is made by the screw-threaded tubular nipples 9, and the fore part of the sections are secured by lugs and bolts 20<sup>a</sup>, or other equivalent means.

If desired, there may be more or less than the number of lugs and bolts shown, or they may be dispensed with and a series of two or



more screw-threaded tubular nipples 9 and extension portions 7 used in lieu thereof for securing the sections together. In place of the screw-threaded tubular nipples 9, an ordinary smooth nipple may be used and the whole forced together in the ordinary way; or, instead of the nipples, any kind of well-known packed joint may be employed.

The top section 21 is provided with a larger area of water-chamber 22, also with a rear extension-chamber 7, having a diaphragm 8 and a screw-threaded nipple-connection. It is also provided with the outlet for the spiral smoke-flue 23, and with a collar 24, to receive the smoke-pipe. (See Figs. 1 and 2.) By this construction a continuous upward course in a spiral direction is provided for the products of combustion, avoiding sharp turns and the hinderance to a natural draft incident to boilers having up-and-down flues or flues having sharp quick turns. It also provides a much longer continuous passage for the products of combustion, which are thereby retained for a proportionately-longer time in contact with the surface to be heated, so as to impart a larger amount of heat in proportion to the fuel used to the water which passes between the surfaces of the spiral smoke-flues.

It will be noticed that the smoke-flue is surrounded on all sides with water, whereby I secure a greater economy in the consumption of fuel and make the boiler complete in itself, so that it can be used without the necessity of surrounding it with brick-work or other covering. I therefore avoid considerable expense and inconvenience in setting it up, and also render the boiler more easy of access and in portable form, so that it may be transported from place to place.

I am aware that boilers have heretofore been made having a portion of the sides of the smoke-flue composed of the brick-work surrounding the boiler; but such construction is objectionable, for the reason that imperfections in the brick-work or cracks resulting from settling or other causes often permit the escape of gas and smoke, which is a serious objection. By my construction I avoid all of these objections and also obtain a large increase of water-surface.

The threaded nipples for securing the extension portions of the sections together afford the means for producing a simple and cheap water-tight connection for the water-joints, and the sections being alike as regards the fitting of each together, one or more can be added or replaced at any time, and as the sections above the fire-box are duplicates any number may be added or taken from the boiler to change its capacity, if desired; or a boiler of any desired size can be easily made up from the sections, depending upon the number used, all being interchangeable. The boiler is self-contained, requiring no brick-

work or casing of any kind to make it complete, and consequently it is portable and easily moved about or removed when required. The inlet-openings 25 may be placed at any conveniently-arranged point at the lower part of the boiler, (see Fig. 1,) and the outlet-openings 26 may be placed at any convenient point at the top of the boiler. (See Fig. 3.)

27 represents what may be called a clean-out door. Its object is to allow access to the smoke-flue to clean it out. I have shown but one; but there may be as many more as may be required to enable the operator to reach the different parts.

I claim as my invention—

1. A sectional boiler provided with a spiral smoke-flue surrounded on all sides by water for conducting the products of combustion from the fire-chamber to the outlet spirally up through the water within the boiler, substantially as described.

2. In a boiler composed of sections each having a spiral water-passage, the combination therewith of extension portions connected by screw-threaded nipples for connecting the spiral passage of each section, thereby forming a spiral passage in a continuous forward and upward direction around the boiler from the inlet to the outlet, substantially as described.

3. A sectional boiler provided with a spiral smoke-flue for conducting the products of combustion from the fire-chamber up through or around the boiler, in combination with a spiral water-passage for conducting the water between or around the heating-surfaces from the inlet to the outlet of the boiler, substantially as described.

4. In a sectional boiler, a series of sections, duplicates of each other, above the fire-chamber, forming a spiral smoke-flue within the boiler, in combination with a spiral water-way surrounding the smoke-flue on all sides, except the inlet and outlet, substantially as described.

5. In a sectional boiler, a boiler-section having a spiral recess on each side forming a portion of a spiral smoke-flue and an intermediate spiral water way or passage, in combination with an extension-chamber provided with a diaphragm interposed between the inlet and outlet openings to prevent the water from reaching the outlet until after it has made a circuit around the section, substantially as described.

6. In a sectional boiler, a series of sections having an annular water-chamber and extension water-chambers provided with diaphragms for causing a circulation of the water, a base portion carrying the grate, and screw-threaded tubular nipples for producing a water-tight joint and securing them together, the whole forming the combustion-chamber, in combination with a series of sections each having a spiral or half-spiral smoke-flue on



opposite sides, and an intermediate spiral  
water-chamber communicating with an ex-  
tension water-chamber having a diaphragm  
for causing the water when it enters the sec-  
5 tion to pass around it before it passes through  
the outlet, screw-threaded tubular nipples for  
securing the extension water-sections, and  
bolts for securing the main sections, whereby

a combined spiral smoke-flue and water-way  
is provided, substantially as and for the pur- 10  
poses described.

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Witnesses:

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ARTHUR J. SANGSTER.