

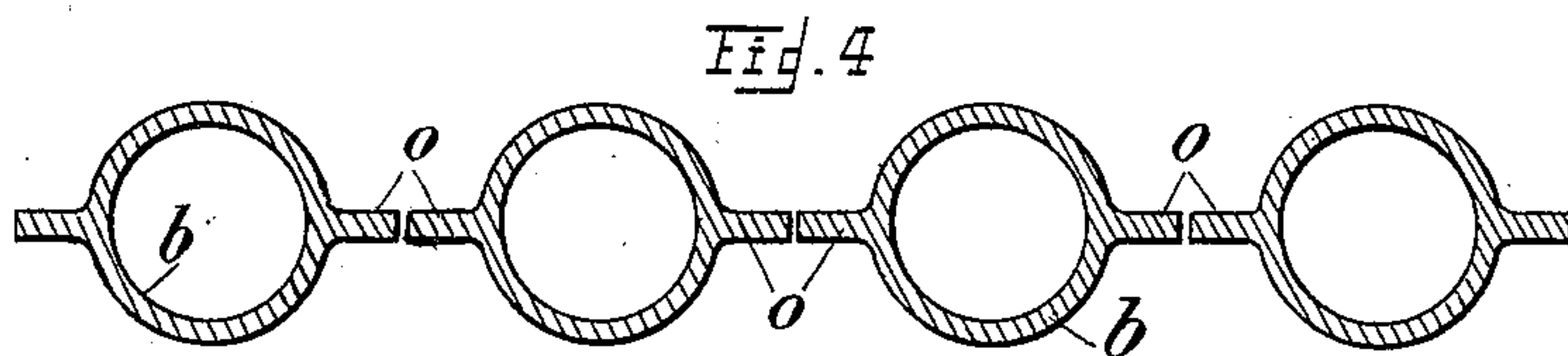
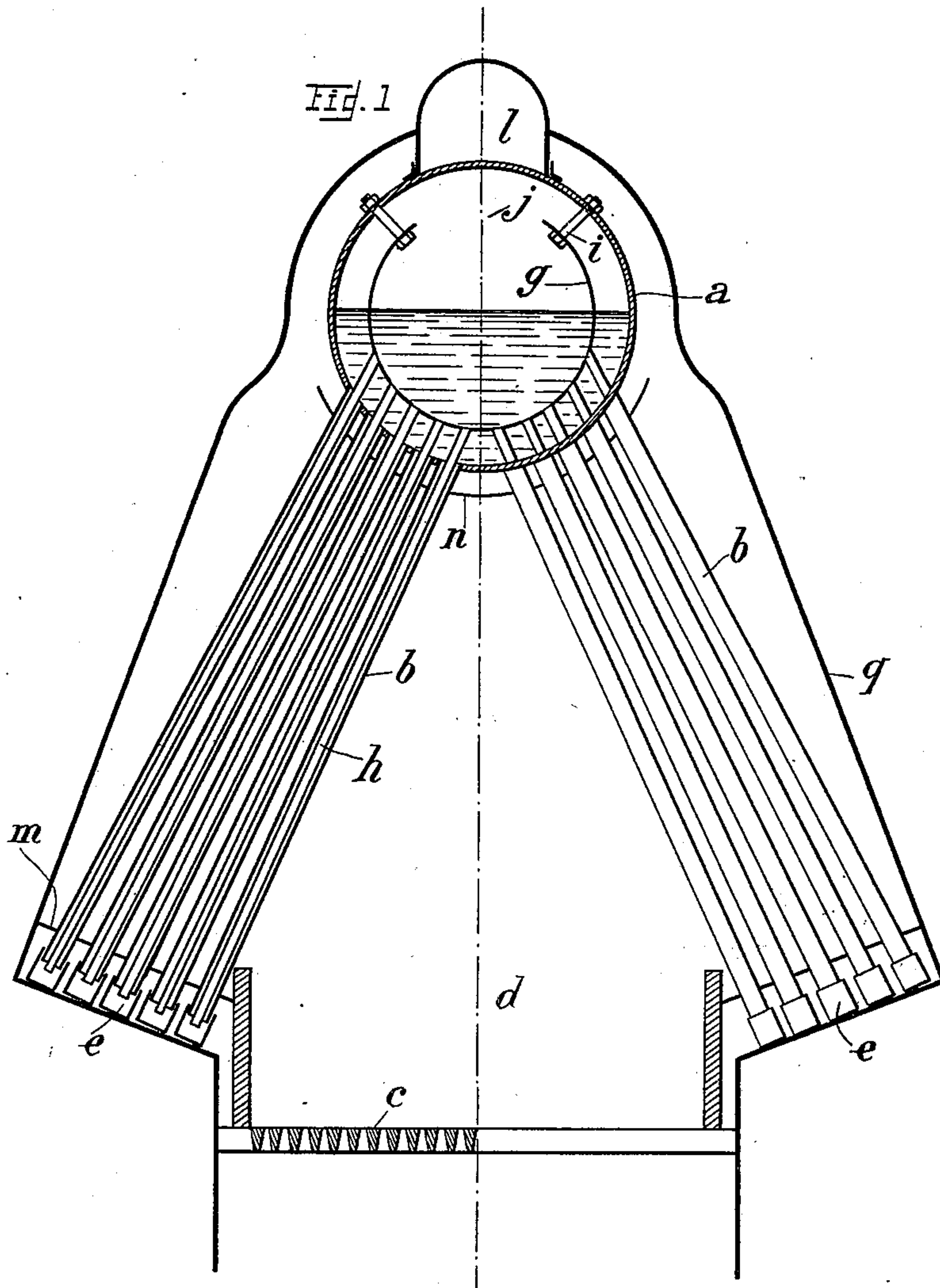
No. 652,866.

Patented July 3, 1900.

L. TURGAN.
WATER TUBE BOILER.
(Application filed May 13, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.
E. H. ...
B. K. Sommers

Inventor.
Louis Turgan.
by
[Signature]
Atty.

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WATER TUBE BOILER.
(Application filed May 13, 1898.)

2 Sheets—Sheet 2.

(No Model.)

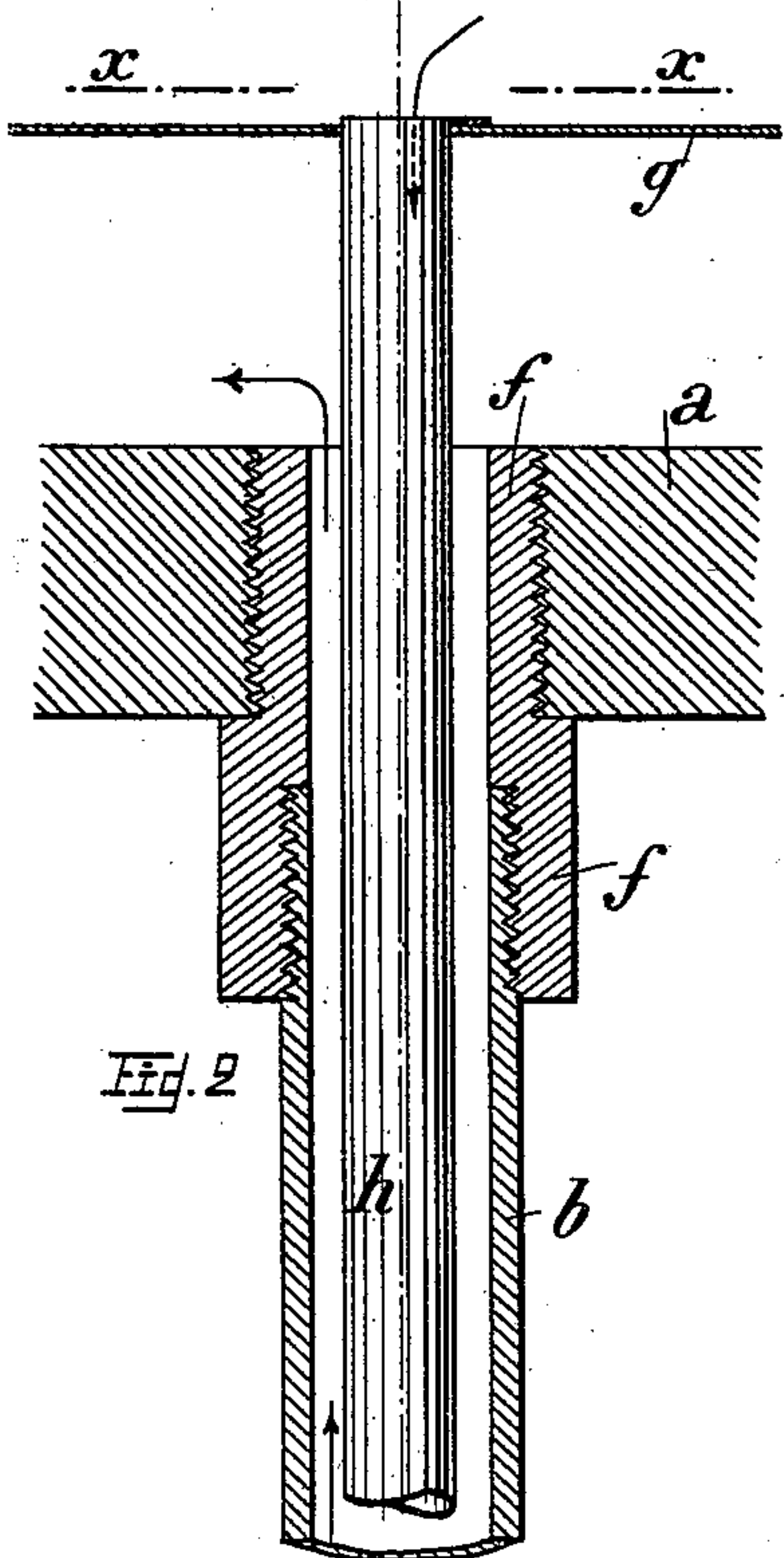


Fig. 2

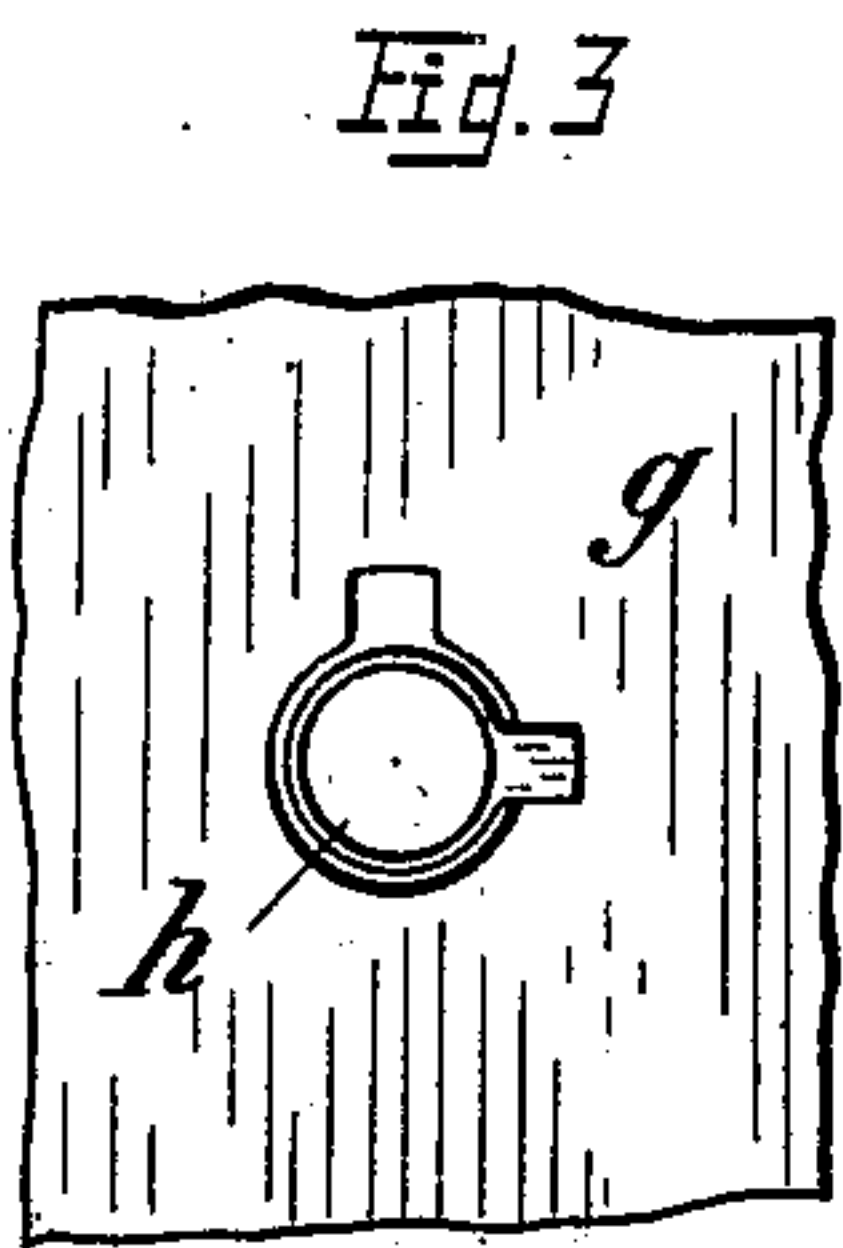
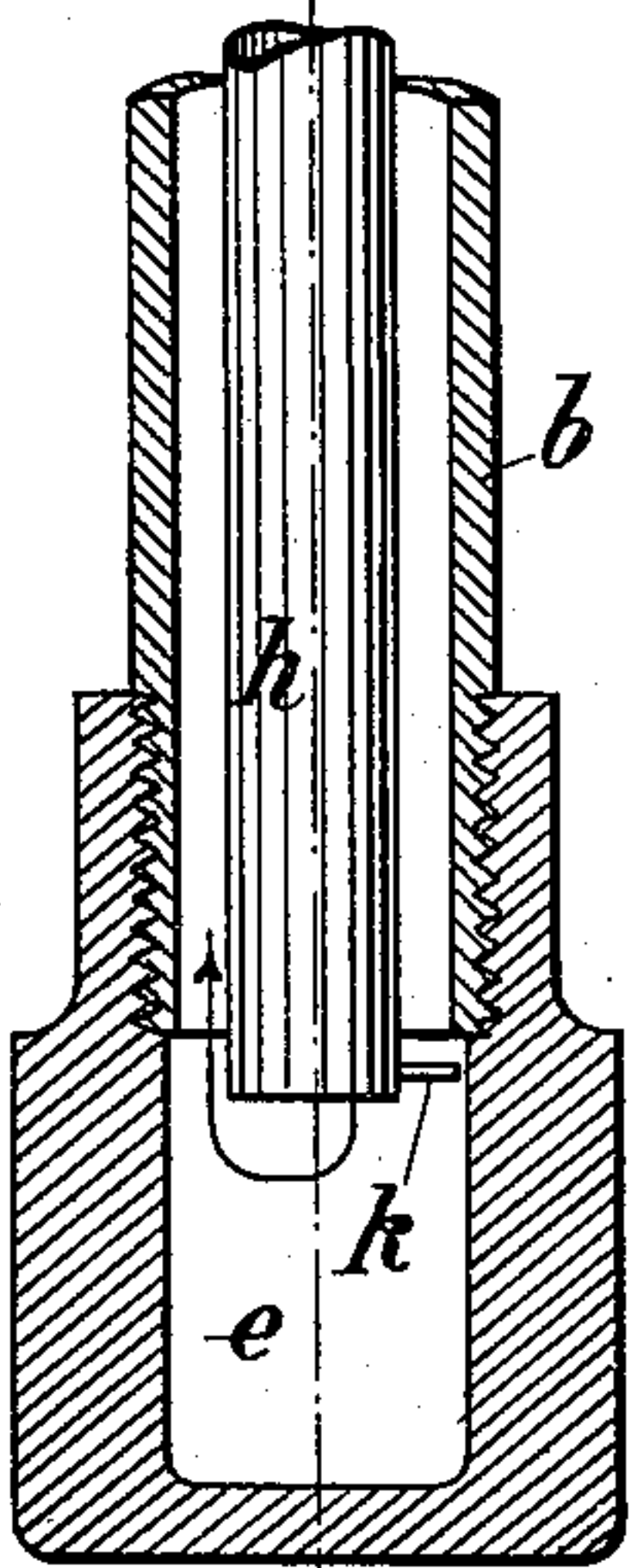


Fig. 3

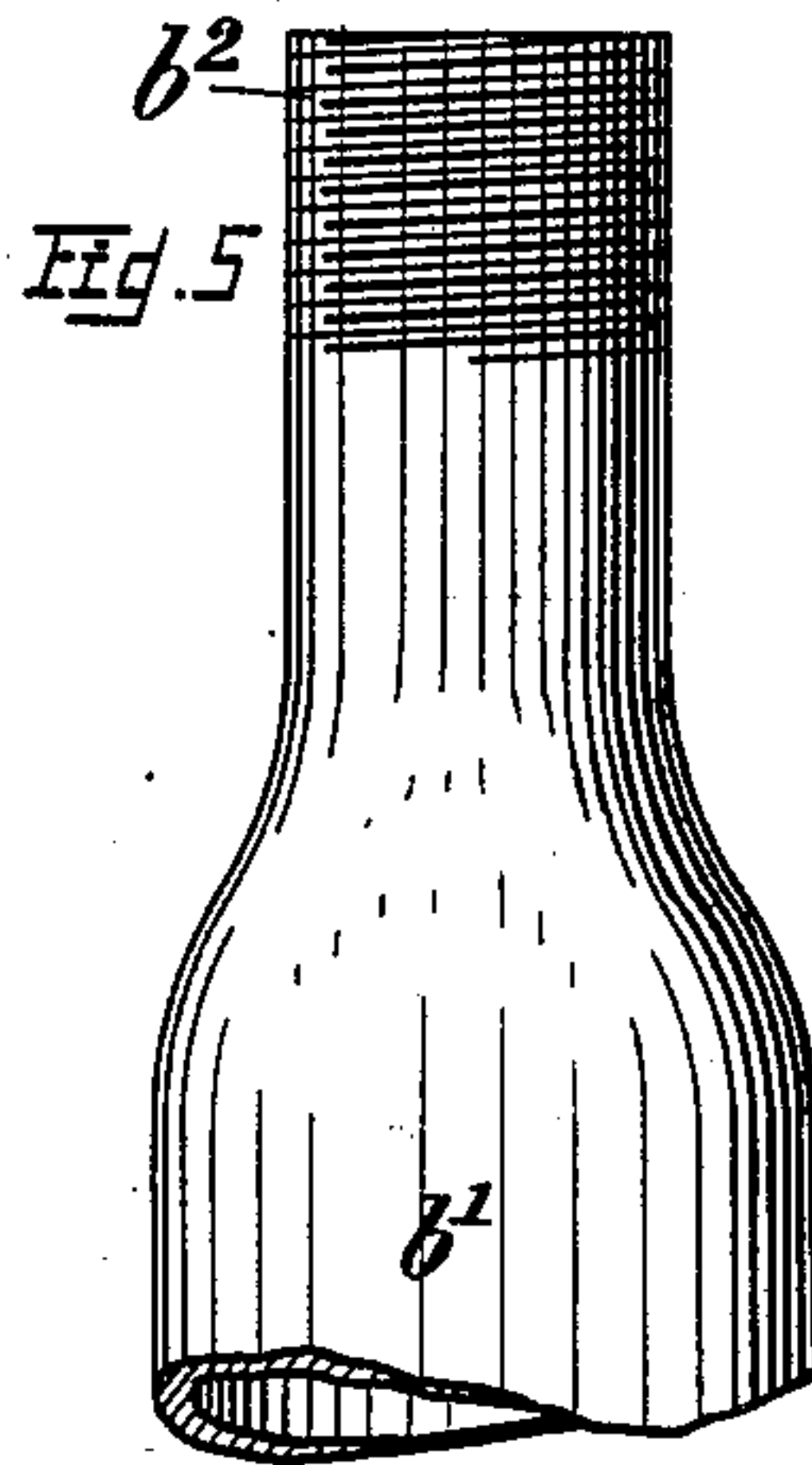


Fig. 5

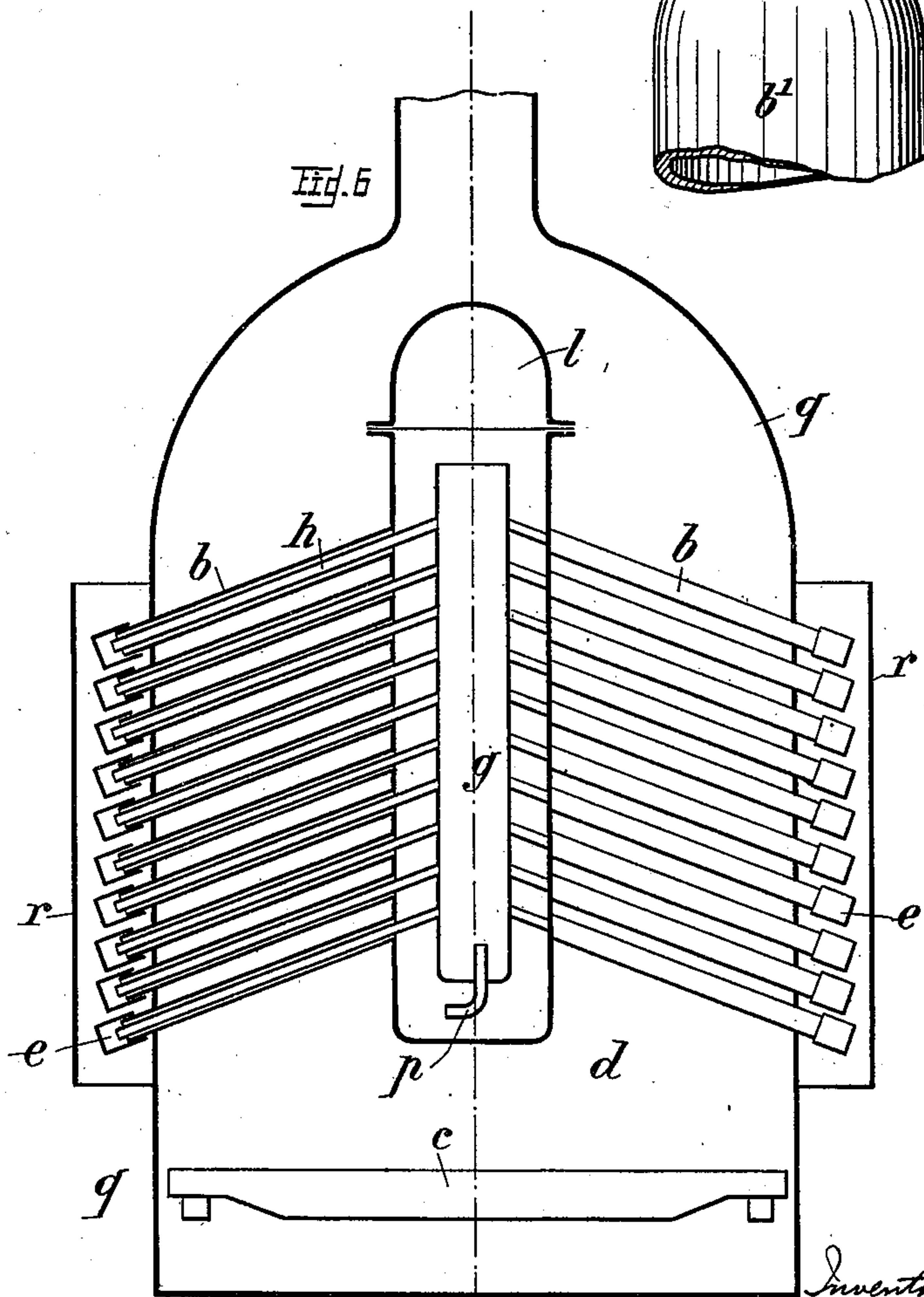


Fig. 6

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UNITED STATES PATENT OFFICE.

LOUIS TURGAN, OF PARIS, FRANCE, ASSIGNOR TO GEORGES DORÉ, OF
SAME PLACE.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 652,866, dated July 3, 1900.

Application filed May 13, 1898. Serial No. 680,602. (No model.)

To all whom it may concern:

Be it known that I, LOUIS TURGAN, a citizen of the Republic of France, residing at Paris, France, have invented a certain
5 new and useful Improvement in Water-Tube Steam-Boilers, (for which I have obtained Letters Patent of France, dated October 18, 1897, No. 271,403, with an addition dated November 23, 1897, bearing the same number, and
10 have applied for Letters Patent of Belgium under date of April 18, 1898;) and I do hereby declare that the following is a full, clear, and exact specification of the same.

The present invention relates to that class
15 of steam-generators known as "multitubular" or "water-tube" generators—that is to say, to generators in which a large portion of the water within the tubes is acted upon by the hot gases.

20 The invention has for its object to provide a generator of that class which shall be simple in construction, in which the series of tubes shall be readily capable of expanding, which shall be easy to take apart for cleaning or other purposes, and in which the circulation of the water shall be accurately
25 guided and controlled and shall take place rapidly. Furthermore, a special arrangement of tubes provides means in accordance with this invention for effecting a circuitous circulation of the gases, so as to cause a perfect utilization of the same.

In the annexed drawings I have shown, by way of examples, my improvement as applied
35 to a generator comprising a horizontal cylindrical shell and to a generator comprising a vertical cylindrical shell.

Figure 1 is a vertical cross-section showing the general arrangement of the system as applied to a generator having a horizontal cylindrical shell. Fig. 2 is a longitudinal-section on a larger scale, showing one of the water-tubes of a series. Fig. 3 is a detail showing in plan above the line xx of Fig. 2 one
45 of the means for mounting a tube upon the concentric collector hereinafter referred to. Fig. 4 is a cross-section showing a special arrangement of tube as means for providing screens in return-flame generators. Fig. 5
50 shows another arrangement of tube capable

of answering the same purpose. Fig. 6 is a similar view to Fig. 1, showing the application of the system to a generator comprising a vertical cylindrical shell.

Referring to Figs. 1 to 5, the boiler comprises a cylindrical horizontal shell a , into
55 which open tubes b , arranged in two series on either side of a vertical plane through the longitudinal axis of the shell a . The two said series are at an angle to each other and terminate near each side of the grating c of the
60 furnace d . The general arrangement, as clearly shown in the drawings, therefore assumes in cross-section the shape of a triangle, the apex of which is formed by the shell a ,
65 the base by the grating c , and the sides by the two series or groups of tubes.

The tubes b are open at their upper ends and issue into the shell a ; but in contradistinction to what has hitherto been the case in
70 generators of a similar construction they do not communicate at their lower ends with lower collectors, which are themselves connected to the shell by large tubes at the outside of the whole arrangement. The herein-
75 described tubes, on the contrary, are closed at their lower ends by a screw-plug e , which also acts, if required, as a receptacle for sediment which may deposit in the tube.

The tubes b are preferably permanently
80 fastened (while being capable of being taken apart) at their upper ends in the shell a . For this purpose I have shown, by way of an example, one of the various means which can be
85 employed to that end. In the arrangement illustrated a short length of tube f is permanently fixed in any suitable manner by being screwed or brazed, for instance, into the shell
90 a . At the end thereof which is exterior to the shell a the said tube is internally screw-threaded for the reception of the upper end of the tube b , which is thus connected to the
95 shell a . It is obvious that other arrangements than the one shown might be employed and that I do not limit my invention to the one
shown and described for fixing the tubes b to the shell a .

Within the shell a is concentrically arranged a collector g , into which open the upper ends of tubes h , placed inside the tubes
100

b and concentrically therewith, into which they extend downwardly and terminate at a short distance from the screw-plugs *e*.

The tubes *h* are open at both ends and may, just like the collector *g*, be made of very thin metal, since they do not have to resist any pressure.

The collector *g* is fastened into the shell by any suitable means, such as bolts and ties *i*, and is provided with one or more openings *j*, by which it communicates with the said shell *a*. As the joint between the tubes *h* and the collector *g* need not be water-tight, it may be obtained by a bayonet-joint. (Shown in Fig. 2 and in plan in Fig. 3.) The tubes *h* may be guided within the tubes *b* by any suitable support, which may with advantage be merely formed of a small tongue *k*, Fig. 2, punched out of the metal of which the tube *h* is made and bent so as to bear against the inner wall of the tube *b* or screw-plug *e*.

The generator operates as follows: The feed takes place solely into the collector *g*. The cold water flows down the inner tubes *h*, rises up between the latter and the tubes *b*, and reaches, being mixed with steam, the shell *a*, which is provided with a usual dome *l*.

It will be seen that my system of generator as compared with Field's generator offers the advantage that the water is accurately guided or controlled without any possibility of its mixing with the steam while circulating through the internal collector and the tubes—a result which it would not be possible to obtain with tubes opening directly into the shell *a*. Furthermore, the ends of the tubes are out of reach of the furnace-fire, from which they are moreover protected, as well as the joints of the tubes in the shell *a*, by shields *m* *n*, respectively.

By unscrewing the plugs *e* access can be had to the interior of the tubes. The plugs might be provided with small cocks or valves through which when open the sediment could be blown off.

By modifying the exterior shape of the tubes *b* a shield or baffle-plate can be formed for causing the flames to follow a return course in return-flame generators. Each tube *b* can be provided, for instance, with two longitudinal external ribs *o*, either arranged on a plane passing through the center of the tubes or otherwise. By arranging the tubes as shown in Fig. 4 it will be seen that a shield will readily be formed. It is also possible to employ tubes *b'*, Fig. 5, of a larger diameter than that of the tubes *b* and reduce them at *b''* at each end at the point wherein they engage the shell *a* and pass through the shield *n*.

I do not limit my invention strictly to the arrangement shown, for it would be possible

to cause it to undergo modifications without departing from the principle of the said invention. For instance, the shell *a* might be duplicated, so as to provide a distinct shell for each series of tubes, all the other arrangements otherwise remaining the same. So-called "double-front" generators might also be constructed by arranging in the extension of each other two generators similar to the one herein described, and by suitably modifying the furnace it will be possible to render the generator capable of being applied to locomotives.

I have herein so far described a generator comprising a horizontal cylindrical shell; but my invention is equally applicable to generators comprising a cylindrical vertical shell, as shown in Fig. 6. In this instance the interior collector *g* opens above the water-level and communicates, on the other hand, at the bottom with the interior of the shell *a* by a bent nozzle *p*, the object being to collect the sediment at the bottom of *g*, while at the same time supplying water at a low temperature to the bottom of *a* in the region most exposed to the action of the furnace. The compound tubes *b* *h*, arranged as previously described, radiate from the shell *a*. They are preferably somewhat inclined with reference to the horizon and are supported at their free ends by the boiler-casing *q*, which for this purpose is provided with suitably-arranged openings. A jacket *r* surrounds the ends of the tubes projecting from the casing *q*.

The details as to the fitting and construction of this arrangement remain the same as those previously described.

I claim—

In a tubular boiler or steam-generator the combination with the generator of a collector of the form of a partial cylinder suspended along its free edges within said generator, the open side of said generator being in the steam-space, sets of circulator-tubes, each composed of an outer tube closed at its lower end and communicating at its inner end with the generator, and inner tubes bayonet-jointed to the collector and extending from the latter to near the lower end of each circulator-tube, said sets of tubes forming legs arranged to straddle a furnace, substantially as described.

In witness whereof I have hereunto set my hand, this 3d day of May, 1898, in the presence of two subscribing witnesses.

LOUIS TURGAN.

Witnesses:

DOUGLAS H. BRANDON,
PAUL FLICOTEAU.