

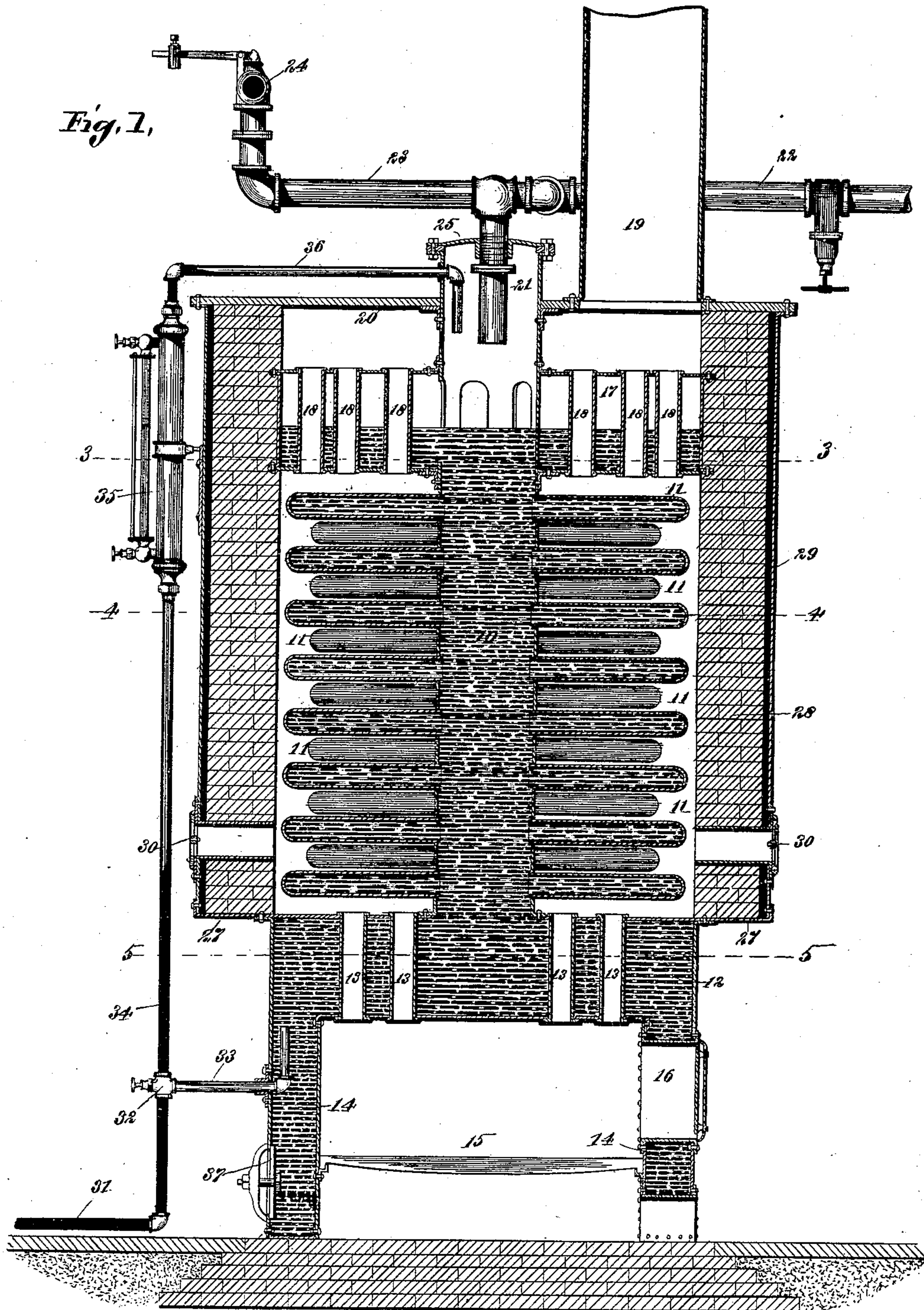
(No Model.)

4 Sheets—Sheet 1.

P. ROHAN.
STEAM BOILER.

No. 407,251.

Patented July 16, 1889.



Witnesses;
G. N. Hinchman Jr.
Charles Pickles,

Inventor;
Philip Rohan
By Fowler & Fowler
Attorneys.

(No Model.)

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Fig. 2.

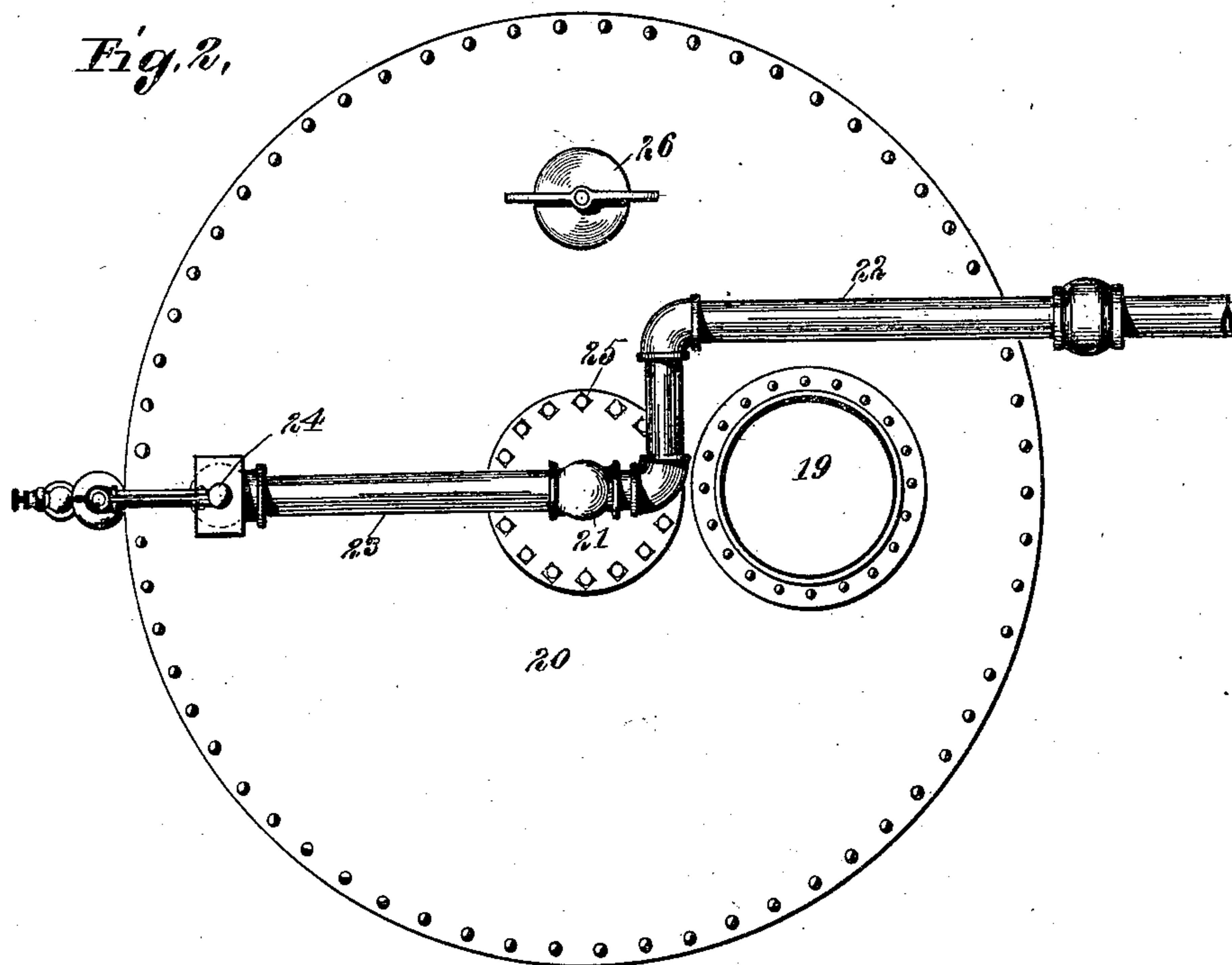
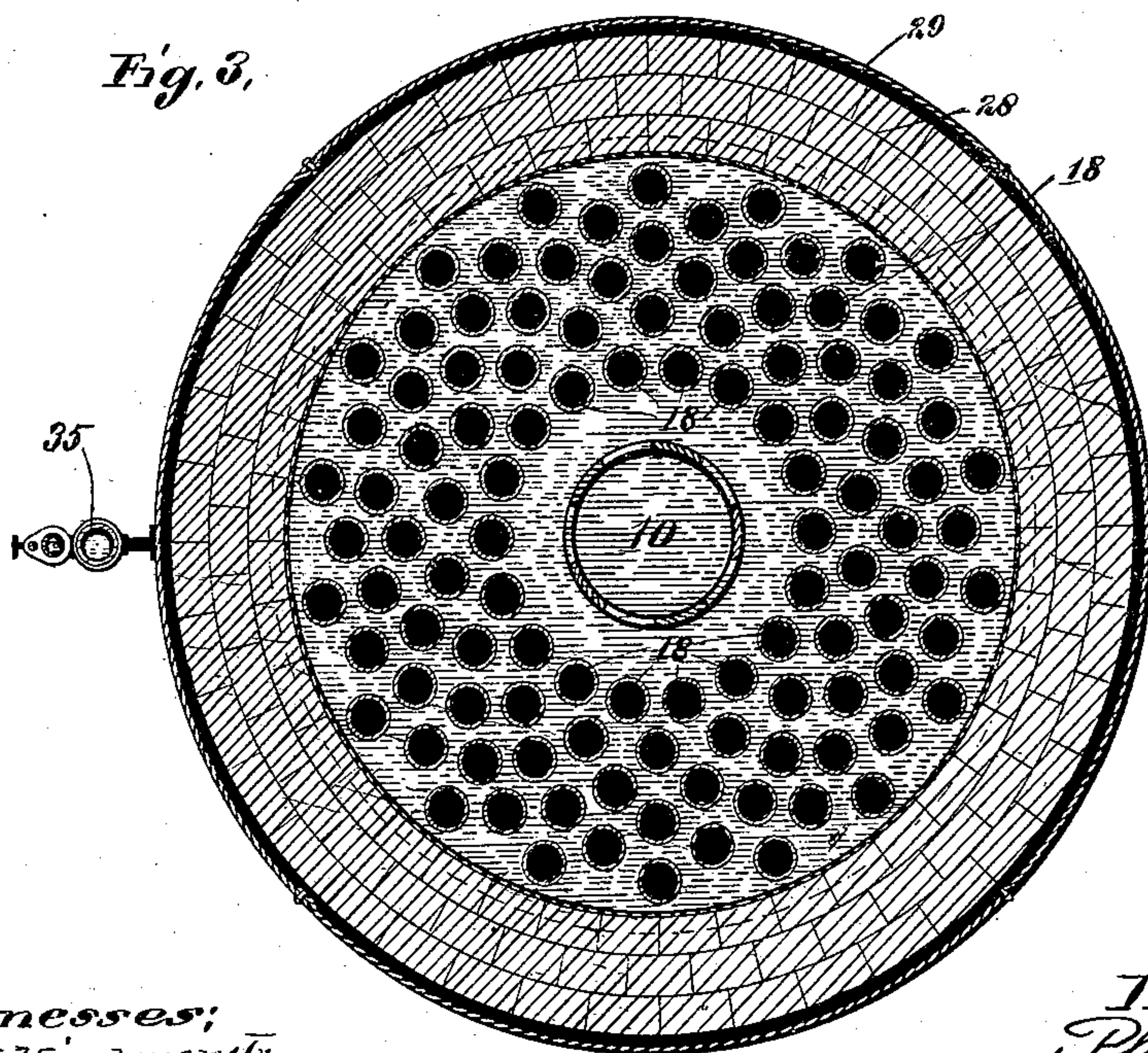


Fig. 3.



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Fig. 4.

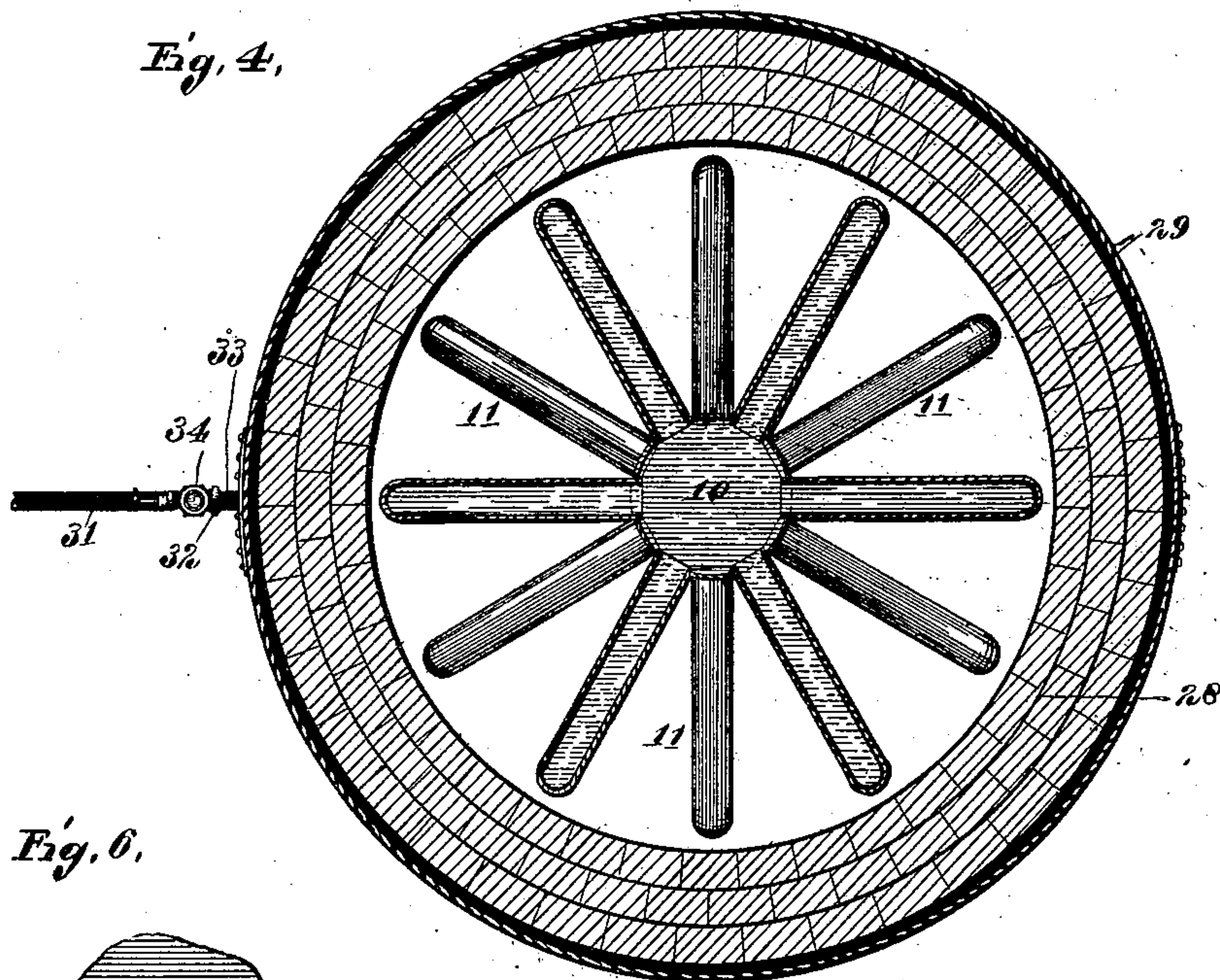


Fig. 6.

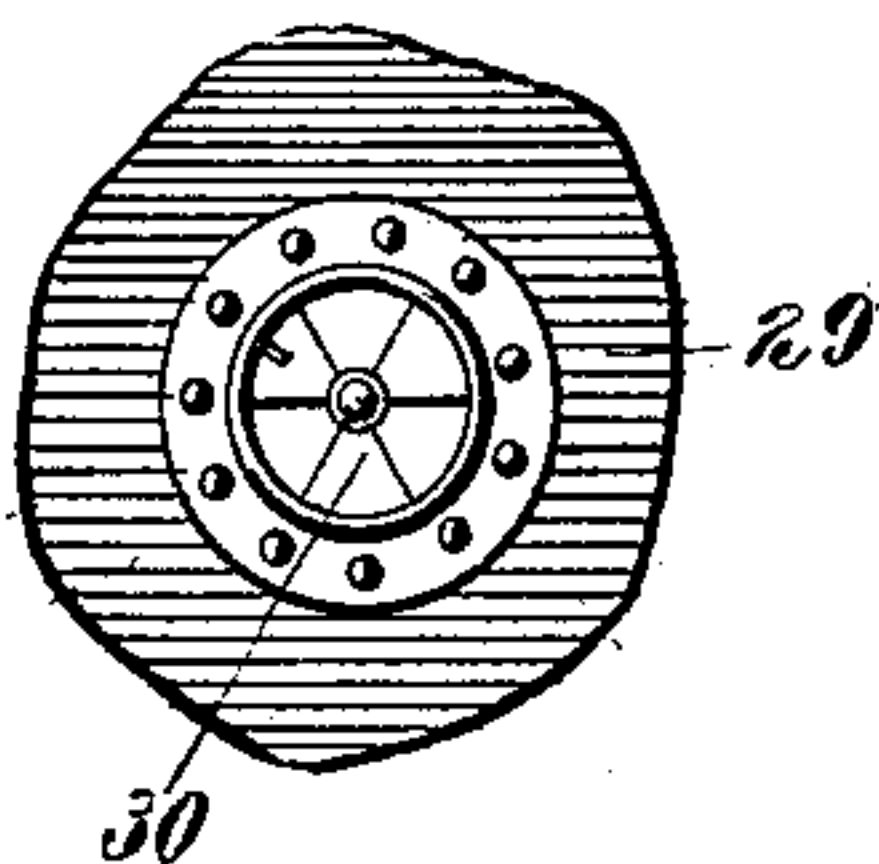
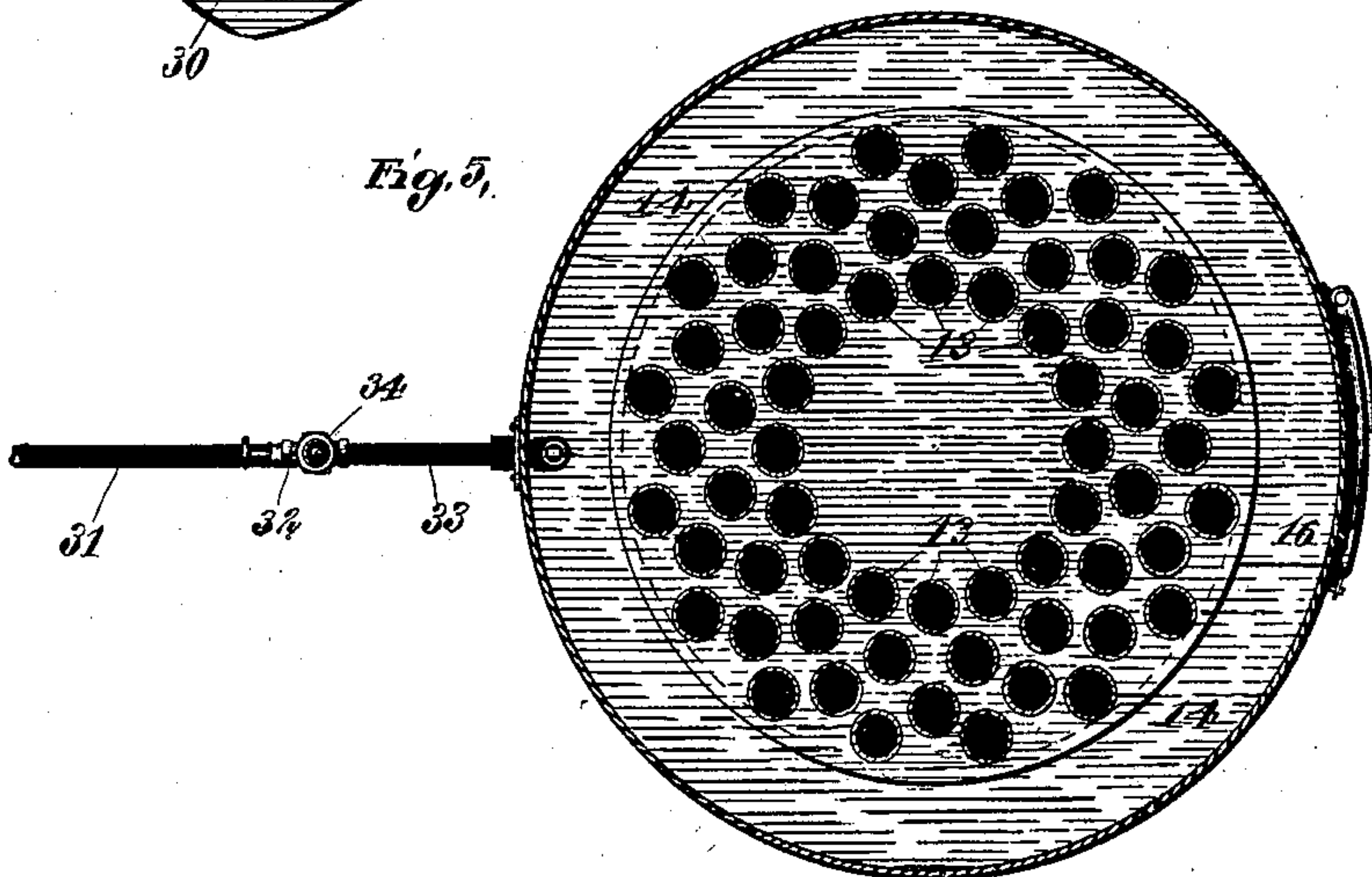


Fig. 5.



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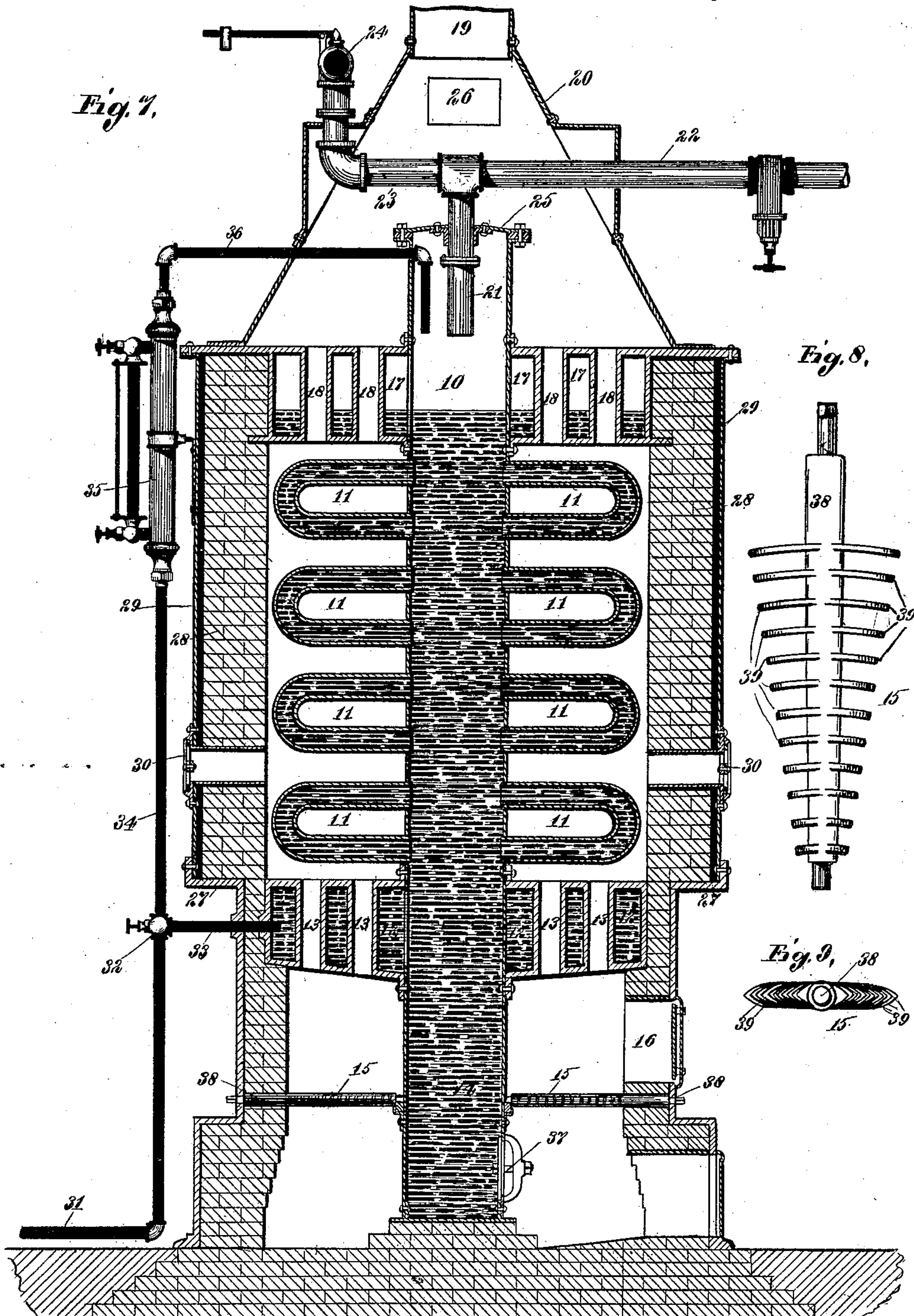
(No Model.)

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P. ROHAN.
STEAM BOILER.

No. 407,251.

Patented July 16, 1889.



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UNITED STATES PATENT OFFICE.

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ERSKINE L. BABCOCK, OF CUYAHOGA FALLS, OHIO.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 407,251, dated July 16, 1889.

Application filed February 4, 1889. Serial No. 298,668. (No model.)

To all whom it may concern:

Be it known that I, PHILIP ROHAN, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Steam-Boilers, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates more particularly to steam-boilers commonly known as "porcupine boilers."

The object of the invention is to render boilers more efficient and to free porcupine boilers from liability to explode.

Figure 1 is an elevation, partly in section, of a porcupine boiler made in accordance with my invention. Fig. 2 is a plan thereof. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1. Fig. 4 is a horizontal section on the line 4 4 of Fig. 1. Fig. 5 is a horizontal section on the line 5 5 of Fig. 1. Fig. 6 is a face view of a detail. Fig. 7 is an elevation, partly in section, of a modification of my invention. Fig. 8 is a plan of the grate-bars used with said modification, and Fig. 9 is an end view of Fig. 8.

The same figures of reference indicate the same or corresponding parts throughout the various views.

Porcupine boilers as usually constructed are made up of a main or trunk part, from which a number of straight pipes extend in radial lines, the hot air passing over and around said radial pipes to heat the water and generate steam, the object being to increase the amount of surface exposed to the heat, and also to cause the heat to impinge at right angles upon the heating-surfaces. Such boilers are arranged horizontally or vertically. The straight pipes radiating from the main part or trunk of the boiler are liable to become incrustated, and especially those pipes which are directly adjacent to the fire. This incrustation primarily results from the fact that the pipes are subjected to too fierce a heat and because there is but little circulation in such straight pipes. It not infrequently happens that such pipes become in-

crusted to such an extent as to permit them to be overheated, and when this happens an explosion usually follows.

The objects of my invention are to overcome this difficulty and to increase the efficiency of such boilers.

Having now more particularly reference to Figs. 1, 2, 3, 4, 5, and 6, 10 is the main part or trunk of the boiler, which is preferably cylindrical in form and vertically arranged. From this main part or tube-sheet 10 extend several series of radial pipes 11 along the length thereof, which are in communication with the main part 10 of the boiler.

In porcupine boilers as now constructed the radial pipes 11 are placed over the fire with nothing intervening between the fire and said pipes, so that the pipes adjacent to the fire are subjected to a very fierce heat. As there is but little circulation in these pipes, they are liable to become incrustated, and finally to burn out and give rise to explosions. In my invention I arrange a drum 12 between said radial pipes 11 and the fire. Through this drum pass any number of fire-tubes 13, whereby the heated air is conveyed to the pipes 11 after a portion of its heat has been communicated to the water in the drum 12 and its temperature thereby reduced to a point where it cannot overheat any of the pipes. The drum 12 communicates with the trunk 10 of the boiler and is extended downward to form the water-leg 14. This water-leg 14 surrounds a grate-bar 15 and is perforated by a door 16, by which access may be had to the fire. The lower part of the boiler, therefore, almost entirely surrounds the fire. After the hot air passes through the tubes 13 and over the pipes 11 it impinges at right angles against a second drum 17, preferably arranged above the series of radial pipes 11. This drum has any number of fire-tubes 18 passing through it, whereby the products of combustion may pass through the same into a smoke-stack 19, which is secured to the top plate 20 of the boiler. The water fills the boiler up to about the middle of the drum 17. It is well known that the more nearly the rays of heat impinge at right angles upon a body to be heated the more effectively said body will be heated. In my invention the water

in the boiler is heated by the direct radiation of the heat of the fire on the water-leg of the boiler by the direct impingement of the heat upon the lower part of the drum 12, after
 5 which the heat passes through and heats the tubes 13 and impinges directly against the pipes 11, and finally impinges at right angles against the lower part of the drum 17, after
 10 which it passes through and heats the fire-tubes 18 and goes to the smoke-stack 19. In the old form of boiler the only direct impingement of the heat upon the boiler was that secured by the pipes 11 and the lower part of the trunk 10. The drum 12, there-
 15 fore, not only protects the pipe 11 from overheating, but it acts as an efficient means to heat the water in the boiler. The upper drum 17 not only serves to heat the water in the boiler, but it also serves to confine the hot air
 20 between the two drums and prevent it from passing too readily into the smoke-stack 19 and becoming dissipated. It thus operates advantageously on the pipes 11. These drums also increase the water and steam space of
 25 the boiler and enable me to construct a more compact boiler. To obtain the same capacity without the drums, as in the old form of boiler, the trunk 10 must of necessity be made much taller and the boiler consequently
 30 so much higher. The drums also serve to protect the tubes 11 when the boilers are shipped, as said drums extend out beyond the tubes 11, and the boilers will rest upon the drums instead of upon the tubes 11.

35 The upper part of the trunk 10 extends through the top plate 20 of the boiler and is perforated by a dry-steam pipe 21, that conveys the steam by means of a pipe 22 to the place where it is used.

40 23 is a pipe that also extends from the steam-pipe 21 to a safety-valve 24. The upper end of the trunk 10 is covered by a plate 25, which is removably secured to said part 10, so that it can serve as a man-hole for the
 45 boiler, whereby any one can go into the interior of the boiler.

26 is a man-hole in the top plate 20 of the boiler, whereby any one can gain access to the exterior of the boiler.

50 27 is a stout flange that extends from the drum 12. This flange supports the brick-work 28, that encircles the boiler. The periphery of the drum 17 is set into the brick-work. Said brick-work is itself encircled by a jacket
 55 29 of metal, which is riveted to the flange 27 and to the top plate 20 of the boiler. Said top plate 20 rests upon the brick-work 28. The flange 27 and water-leg 14 support the entire boiler.

60 30 are registers in the casing 29, that extend through the brick-work 28. They are for the purpose of regulating the intensity of the heat between the drums.

65 31 is the feed-water pipe, which opens into a three-way cock 32, from which extends a pipe 33, which passes in the water-leg of the boiler. Through this pipe the feed-water is

fed to the boiler. From the cock 32 also extends a pipe 34, which is connected to the lower part of the water-gage 35. The upper
 70 part of said water-gage is connected by a pipe 36 with the steam-space of the boiler, so as to equalize the pressure in said water-gage. These features are no part of my invention. 37 is a cap that closes an opening in the wa-
 75 ter-leg 14, whereby the sediment may be removed or blown out from the boiler.

By the above-described arrangement I secure greater efficiency than is attained by the ordinary porcupine boiler without having any
 80 of the attendant dangers.

Figs. 7, 8, and 9 show a modified form of boiler. The curved form of the pipe shown in this modification causes such an active
 85 circulation that incrustation of these pipes is prevented, so that they cannot be overheated. In this modification I also preferably use the drum 12, which acts as a shield to the pipes
 90 11 and reduces the temperature of the hot air before it reaches the pipes 11, as in the previous case, thereby employing two precautions to prevent the pipes from overheating and exploding. The bent pipes 11 extend radially from the trunk 10, as before.

In the modification also the top of the drum
 95 17 is placed so as to be on a level with the top of the brick-work 28, the top plate 20 in said modification taking the form of a cone, which envelops the upper part of the trunk or
 100 tube-sheet 10 and a part of the dry-steam pipes 21, 22, and 23. At the apex of the cone is the smoke-stack 19. The cone acts to keep warm the steam-pipes and the upper part of the boiler, and it also permits me to use a cen-
 105 trally-disposed smoke-stack, which causes the draft to be more equalized in passing over the heating-surfaces, and thus prevents it from being greater on one side of the boiler than on the other. 26 is a man-hole in the cone,
 110 by which access may be had to the exterior of the boiler, and also to the interior of the boiler, by removing the plate 25, as before.

The brick-work in Fig. 7 is built from the floor up and sustains the boiler, the drum 12
 115 in this instance being sustained by said brick-work and the trunk 10 of the boiler, which is extended downward to form a centrally-disposed water-leg 14, that is supported from the foundation of the boiler. The fire-grate 15 in
 120 this instance is annular in form, and is supported by the water-leg 14 at the inner end and by the brick-work at the outer end. Said fire-grate consists of a number of sector-like grate-bars, (see Fig. 8,) each of which has its
 125 axle 38 extended through the brick-work and metal casing 29, so that they can be actuated from the outside of the furnace. The axle 38 has a number of arms 39 extending from each side thereof along the same, the said arms 39
 130 diminishing in length from the outer to the inner end of each of the grate-bars. The free ends of the arms 39 are drawn to a sharp point, so that when the grate-bar is turned in one or the other direction the said arms will break

up any clinkers that may be upon the grate. The modified furnace above described has all the advantages of the previously-described boiler, and possesses, besides, the additional advantages above enumerated.

Various changes may be made in my invention without departing from the spirit thereof. I do not wish, therefore, to confine myself to the exact construction set forth. The bent pipes 11 (shown in Fig. 7) can be used equally well with the boiler shown in Fig. 1.

Having fully set forth my invention, what I desire to claim and secure by Letters Patent of the United States is—

1. The combination, in a boiler, of a main part or trunk, one or more series of radial pipes 11 extending therefrom, a drum between the source of heat and said pipes communicating with said main part to act as a shield for said radial pipes, and fire-tubes 13 passing therethrough.

2. The combination, in a boiler, of a main part or trunk, a drum communicating with said main part adjacent to the source of heat, a second drum communicating with said main part remote from said source of heat, and several series of pipes, as 11, extending from said main part and located in the space between the two drums, for the purpose described.

3. The combination, to form a boiler, of the main part 10, the drum 12, communicating therewith, having fire-tubes 13 passing

through the same, the upper drum 17, also communicating with said main part 10 and having fire-tubes 18 passing through it, and several series of radial pipes 11, extending from said main part 10 between said drums.

4. The combination, to form a boiler, of the main part 10, vertically arranged, the water-drum 12, communicating with the same, having fire-tubes 13 extending therethrough, the water-leg 14, opening into said drum, the grate 15 adjacent to the aforesaid drum and water-leg, the radial pipes 11, extending from said main part 10, a second drum 17 above said pipes communicating with the main part 10, having fire-tubes 18 passing therethrough, a top 20, smoke-stack 19, and steam-connections, as set forth.

5. The combination, in a boiler, of a main part, a horizontally-disposed drum communicating therewith adjacent to the source of heat, a water-leg 14, opening into said drum, a casing for said boiler, and a flange 27, extending from said drum for supporting said casing.

In testimony whereof I have hereunto set my hand and affixed my seal, this 30th day of January, 1889, in the presence of the two subscribing witnesses.

PHILIP ROHAN. [L. S.]

Witnesses:

A. C. FOWLER,
M. S. REEDER.