

No. 669,359.

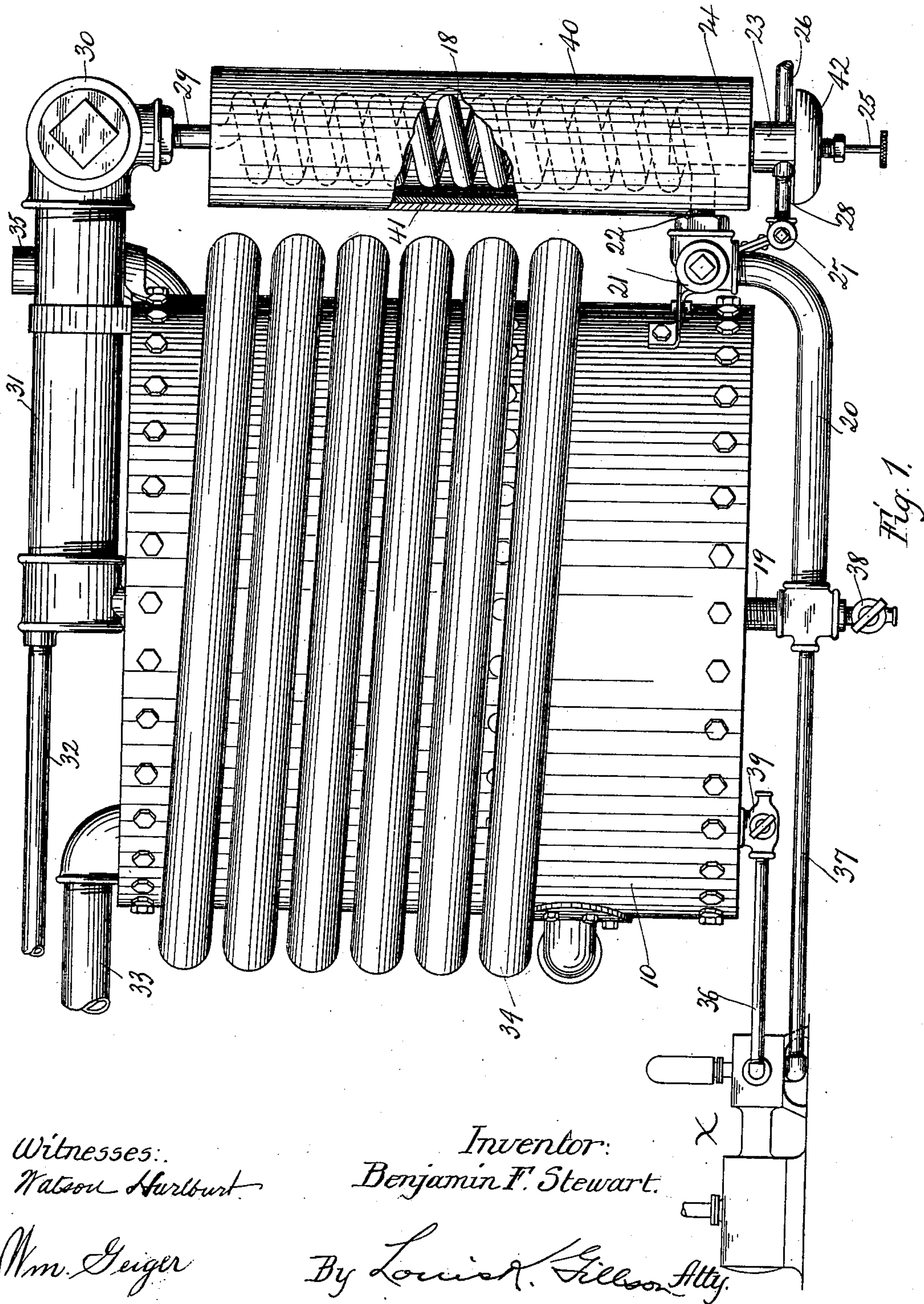
Patented Mar. 5, 1901.

**B. F. STEWART.
STEAM GENERATOR.**

(Application filed Nov. 5, 1900.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses:

Watson Hurlburt

Wm. Geiger

Inventor:

Benjamin F. Stewart.

By Louis R. Gilson Atty.

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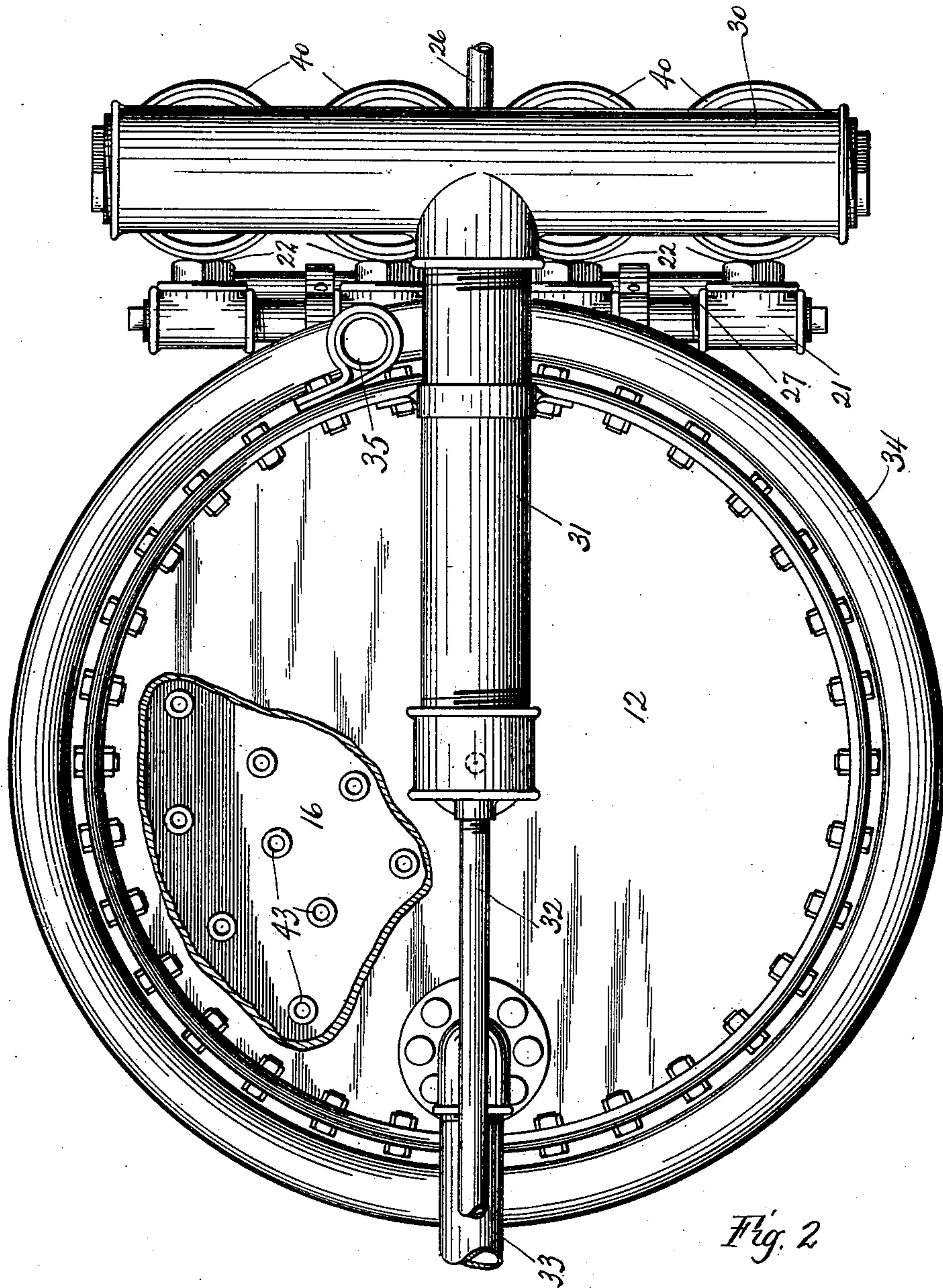


Fig. 2

Witnesses:
Watson Hurlburt
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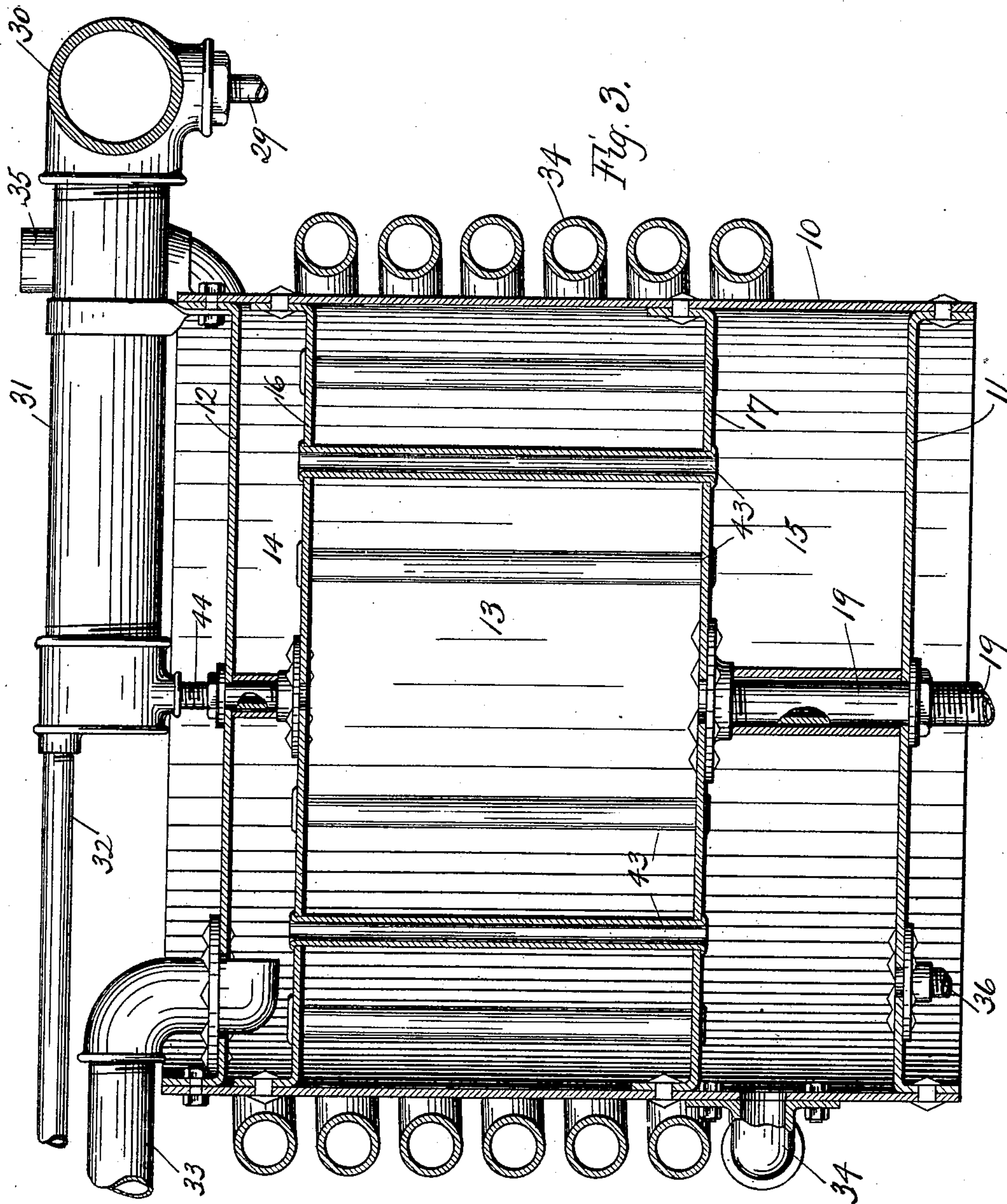
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4 Sheets—Sheet 3.



Witnesses:
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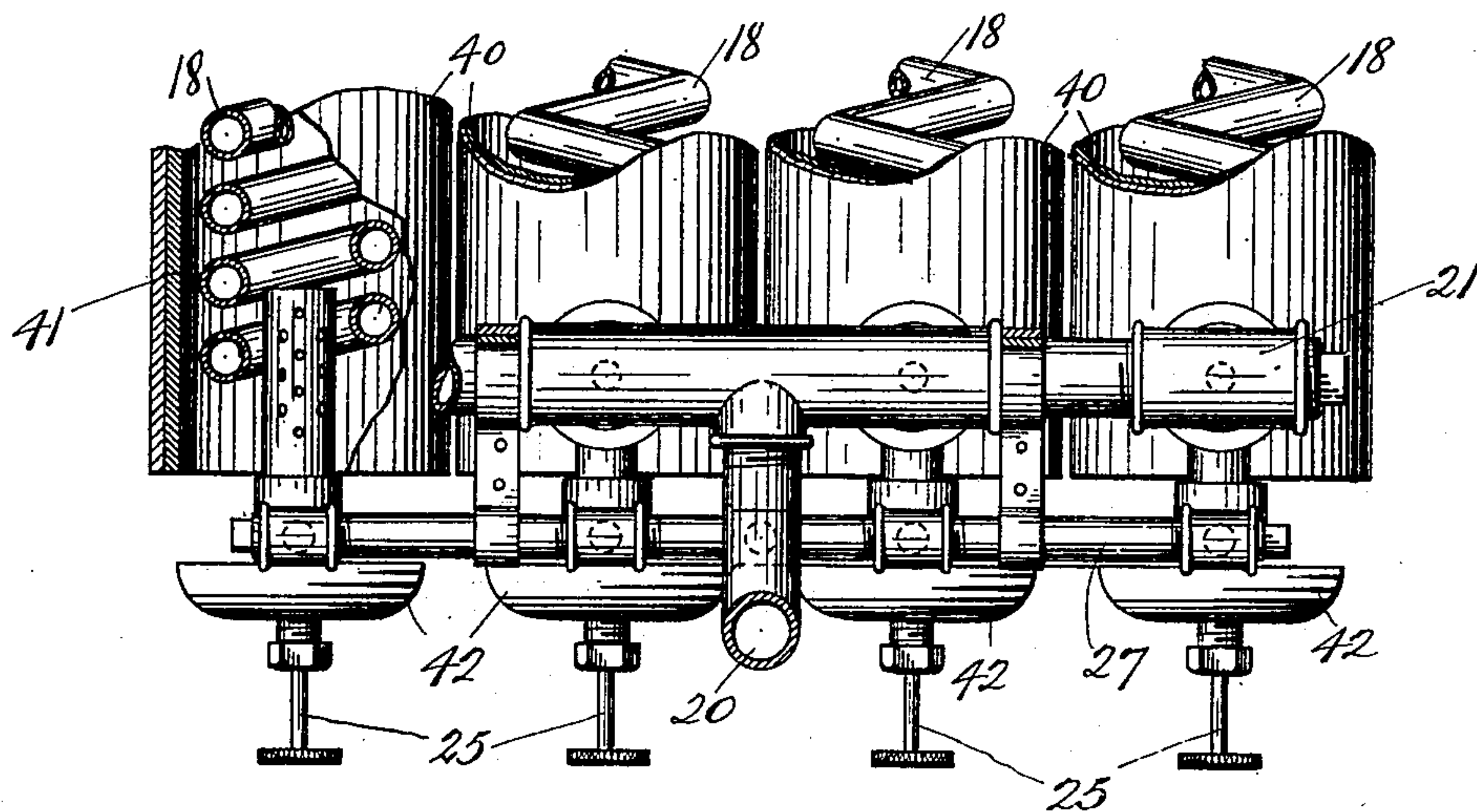


Fig. 4.

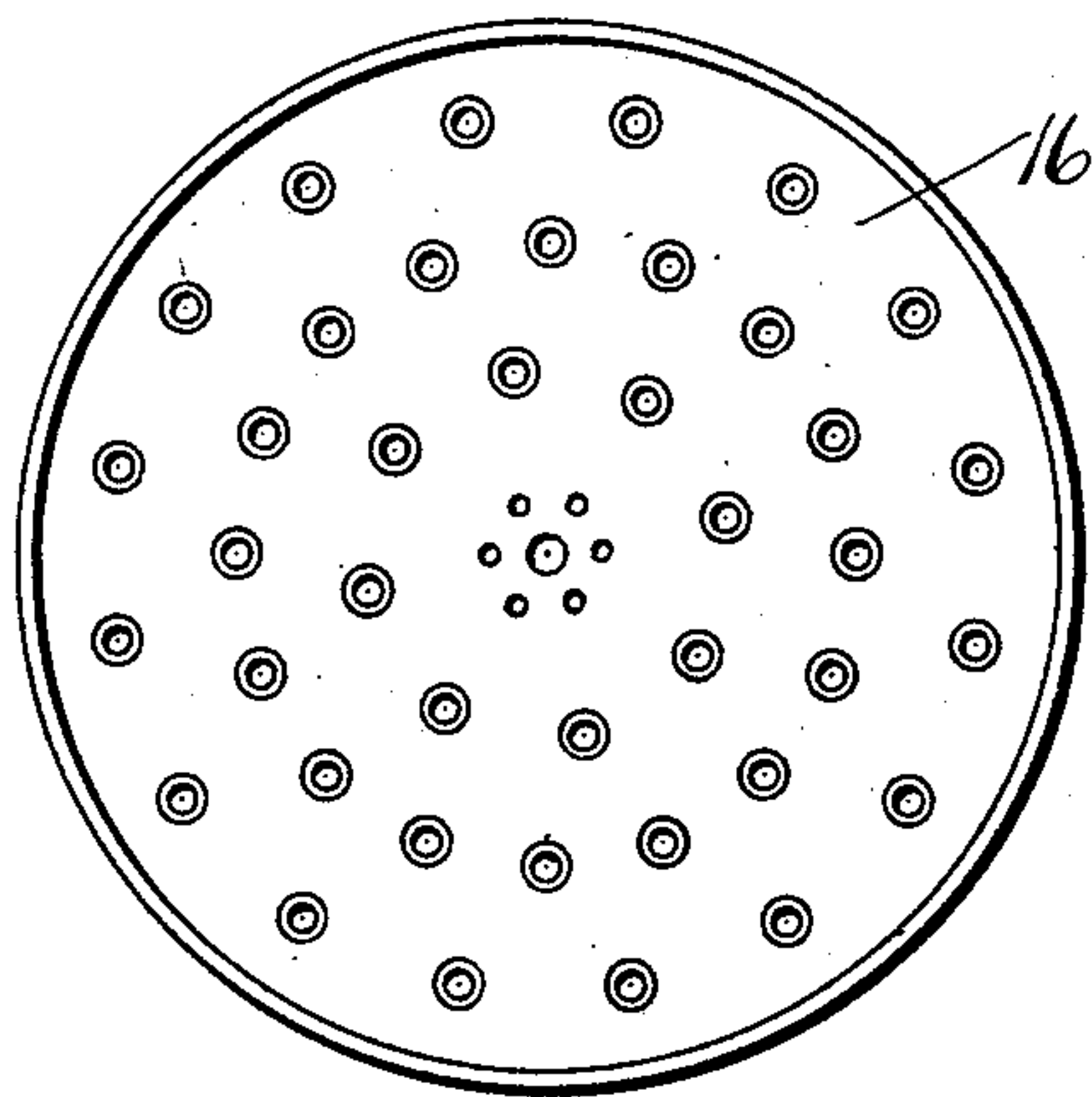


Fig. 5.

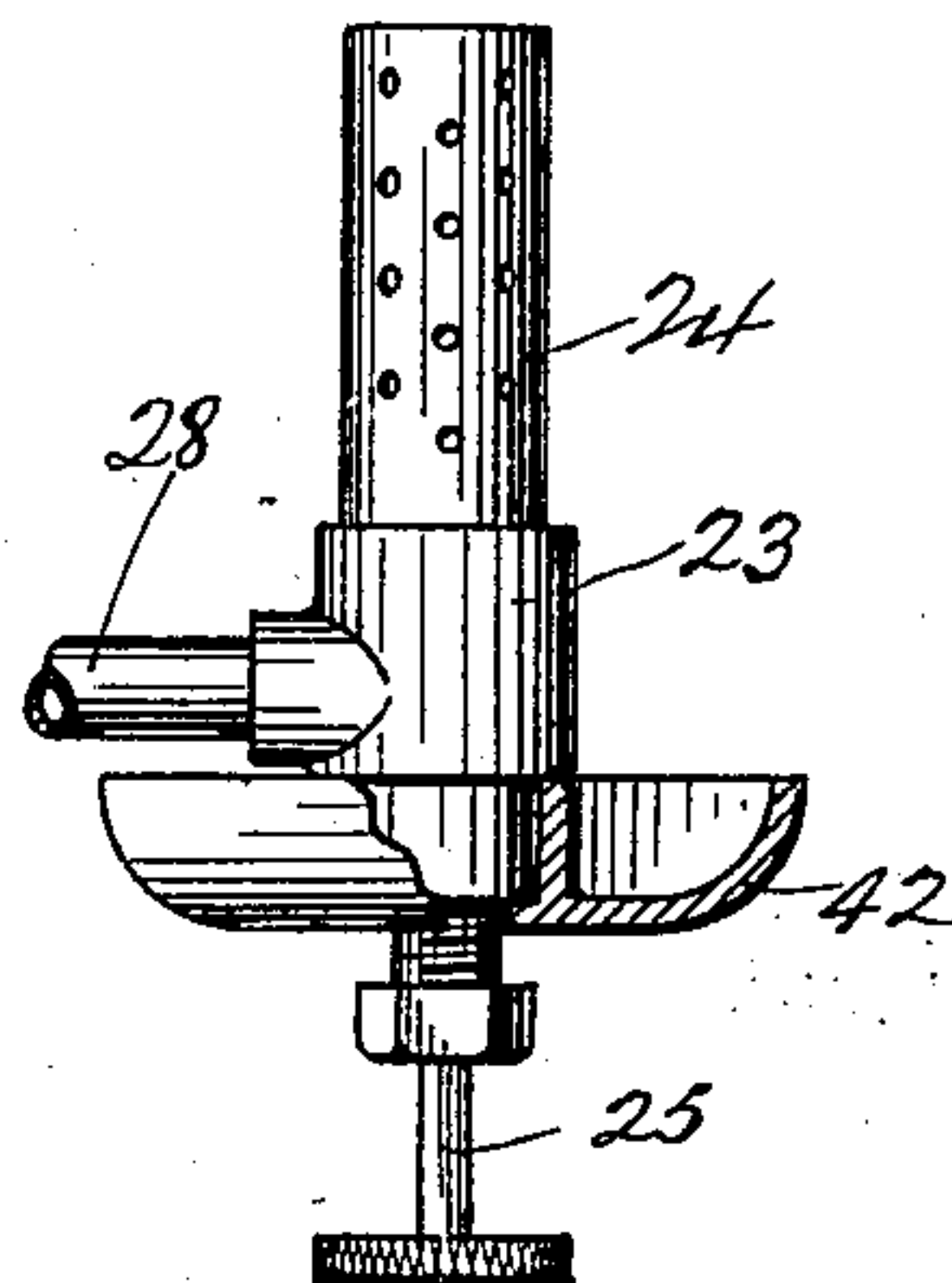


Fig. 6.

Witnesses:

Matson Hurlburt

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Inventor:

Benjamin F. Stewart

By Louis A. Gleason Atty.

UNITED STATES PATENT OFFICE.

BENJAMIN F. STEWART, OF CHICAGO, ILLINOIS.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 669,359, dated March 5, 1901.

Application filed November 5, 1900. Serial No. 35,550. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. STEWART, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The object of this invention is to provide a simple, compact, and highly-efficient steam-generator in which gas or vapor is utilized as a fuel; and the invention consists, broadly, in a coil of pipe, having a vertical axis, upon which a flame is located, provision being made for delivering water to the lower end of the coil and for conveying steam from its upper end to a steam dome or chamber.

The invention consists, more specifically, in the various parts and arrangement of parts, as hereinafter fully described, and as illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the generator, some parts being broken away. Fig. 2 is a plan view of the same, some parts being broken away. Fig. 3 is a vertical section through the water-chamber and its accessories; Fig. 4, a detail elevation of the generator, some parts being broken away; Fig. 5, a plan section of the water-chamber; and Fig. 6, a detail, partly in section and partly in elevation, of one of the burners.

A tank 10, preferably cylindrical in form, is provided with a bottom 11 and top 12 and is divided into three compartments by the partitions 16 and 17, the central compartment 13 constituting a water-chamber, the upper compartment 14 an exhaust-steam chamber, and the lower compartment 15 a condensing-chamber.

Pipe-coils 18, of any desired number, each arranged upon a vertical axis, are connected at their lower ends, as shown at 22, with a cross-head 21, connected, by means of the pipes 19 and 20, with the water-chamber 13. A fluid-burner 23, of any desired form, is located directly below and upon the axis of each one of the coils 18, its chimney 24 extending upwardly within the coil, so that the heat developed by the flame of the burner circulates upwardly through the various convo-

lutions of the coil. Each burner is provided with a valve, the stems of which are shown at 25, and the several burners are supplied with fuel from any suitable source of supply by means of the pipe 26, leading to a cross-head 27, with which each burner is connected by means of a nipple, as shown at 28. A cup or basin 42 is located at the base of each burner and serves as a receptacle for a small quantity of oil for the initial heating of the burner when a hydrocarbon fuel is used. The upper end of each of the coils 18 is connected, as shown at 29, with a steam cross-head 30, which in turn connects with a steam drum or dome 31, from which there leads a pipe 32 for conveying steam to a motor. (Not shown.)

At 33 is shown a return or exhaust pipe which leads the exhaust-steam back from the motor and discharges it into the chamber 14, from which it is conveyed to the condensing-chamber 15 through the water-chamber 13. The pipe or pipes for connecting the chambers 14 and 15 may take any suitable and preferred form. I show for this purpose a plurality of vertical pipes 43. So much of the steam as may not be condensed on its return to and within the chamber 15 is led therefrom through an exhaust-coil 34 and the ultimate exhaust-outlet is shown at 35.

For economizing space and for other reasons hereinafter stated the exhaust-pipe leading from the chamber 15 is preferably coiled about the tank 10. The water of condensation is discharged from the condensing-chamber 15 through a pipe 36, which may lead to a pump X and be returned as feed-water through the pipe 37, which connects with the pipes 19 and 20 at their juncture, so that the water-supply may lead directly to the coils 18 or upwardly into the water-chamber 13. Drain-cocks 38 39 are provided for the pipes 19 and 36 for convenience in draining the chambers 13 and 15 of their contents.

Each of the coils 18 is inclosed within a cylinder 40, and these cylinders are preferably provided with a lining 41 of asbestos or other similar material.

The steam drum or dome 31 is connected by means of a pipe 44 with the water-chamber 13 for the double purpose of returning to this chamber any water which may be carried up into the steam-chamber by the ascending

steam and of maintaining an equal pressure within the steam and water chambers.

The operation of the generator is as follows: Water being supplied through the pipe 37 rises to an equal level in the water-chamber 13 and the coils 18. A flame being kindled at one or more of the burners 23, the coils coöperating with such burners are quickly heated and the generation of steam commenced therein, the steam rising into the cross-head and dome and being delivered therefrom to the engine through the pipe 32 and returned after use through the pipe 33. As the water is vaporized in the tubes 18 a new supply is provided from the water-chamber 13, the equalizing of pressure within this chamber and the steam-chamber through the pipe 44 permitting a free flow to the coils in order to maintain the water therein at a level of that within the reservoir. The exhaust-steam serves to heat the water within the chamber 13, being first spread over the top thereof and then conveyed directly therethrough to the chamber 15, which is coextensive with the bottom of the water-chamber. By this means when steam is being utilized the water within the reservoir will be raised substantially to a boiling-point.

This generator is designed more especially for use in motor-vehicles, and by coiling the exhaust-pipe 34 around the tank 10 there is a great gain in economy of space, and the air-currents are not only kept away from the walls of the tank, but are utilized in completing the condensation of the steam, so that the exhaust at the nozzle 35 will be very slight and the water-supply will be wasted but very slowly.

An added advantage of returning the water of condensation to the generator in such manner that it may at once pass to the steam-coils is found in the fact that it thus returns entirely free from sediment and the mineral deposit within the steam-generating tubes is thus reduced to a minimum.

It will be seen that the ends of the coils 18 are connected with the headers 23 and 30 by ordinary form of union-joints, so that should there be any clogging by an accumulation of sediment within the coils they may be readily removed and replaced.

By providing a plurality of steam-generating coils an economy of fuel may be secured by more directly concentrating the flame upon the water-tube, and provision is also made for readily varying the generation of steam to correspond with variations in the work to be accomplished, each of the generators being entirely independent of the others, so that any number may be used, as may be desired. When the generation is commenced, water is carried to some extent upwardly with the steam, but readily finds its way back into the water-chamber through the pipe 44. As soon

as the parts become well heated the water is transformed into steam with such rapidity that the steam passes up into the steam-dome in the comparatively dry state.

I claim as my invention—

1. In a steam-generator, in combination, a tank having a water-chamber and communicating chambers for exhaust-steam above and below the water-chamber, a generating-pipe coil in communication with the water-chamber, means for conveying steam from the generating-coil to a motor, and means for returning exhaust-steam from the motor to one of the steam-chambers of the tank.

2. In a steam-generator, in combination, a tank having a water-chamber, chambers for exhaust-steam above and below the water-chamber and being in intercommunication therethrough, a generating-pipe coil in communication with the water-chamber, means for conveying steam from the generating-coil to a motor, and means for returning exhaust-steam from the motor to the upper steam-chamber of the tank.

3. In a steam-generator, in combination, a tank having a water-chamber and communicating chambers for exhaust-steam above and below the water-chamber, a generating-pipe coil in communication with the water-chamber, means for conveying steam from the generating-coil to a motor, means for returning exhaust-steam from the motor to one of the steam-chambers of the tank, and means for conveying the water of condensation from such steam-chambers to the pipe-coil.

4. In a steam-generator, in combination, a tank having a water-chamber and communicating chambers for exhaust-steam above and below the water-chamber, a generating-pipe coil in communication with the water-chamber, means for conveying steam from the generating-coil to a motor, means for returning exhaust-steam from the motor to one of the steam-chambers of the tank, and an exhaust-pipe leading from such steam-chambers and being coiled around the tank.

5. In a steam-generator, in combination, a plurality of pipe-coils, a fluid-burner applied to the foot of each coil, a steam-chamber, and a water-reservoir in communication with the foot of each of the coils.

6. In a steam-generator, in combination, a tank having a water-chamber and chambers for exhaust-steam below the water-chamber, a generating-pipe coil in communication with the water-chamber, means for conveying steam from the generating-coil to a motor, and means for returning exhaust-steam from such motor to the steam-chamber and leading through the water-chamber.

BENJAMIN F. STEWART.

Witnesses:

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E. M. KLATCHER.