

G. VON ACH.  
 APPARATUS FOR MAKING OXYGEN.  
 APPLICATION FILED JULY 20, 1909.

Patented Dec. 28, 1909.  
 2 SHEETS—SHEET 1.

944,473.

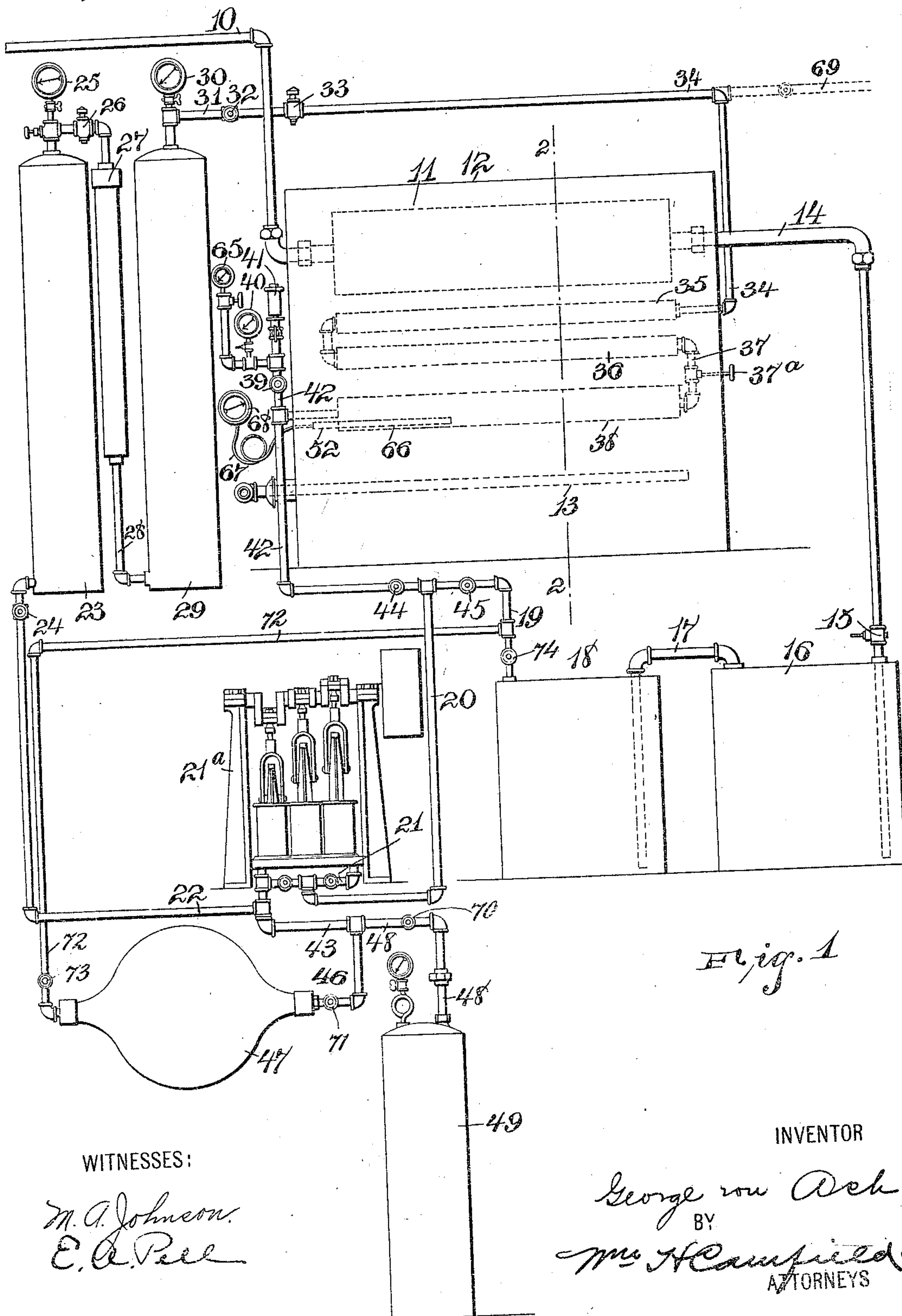


Fig. 1

WITNESSES:

M. A. Johnson.  
 E. A. Peck

INVENTOR

George von Ach  
 BY  
 Mrs. H. Campfield  
 ATTORNEYS

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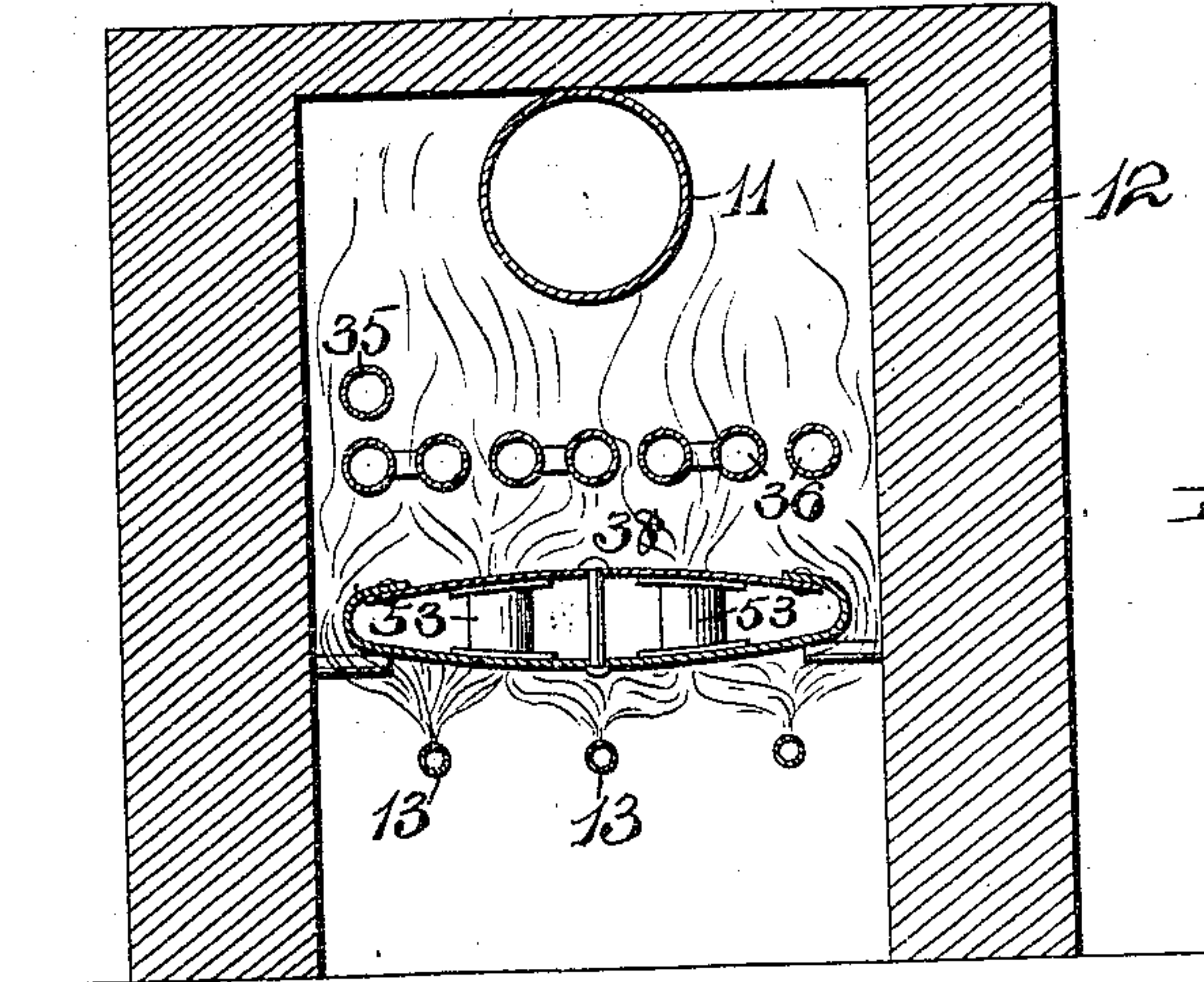


Fig. 2

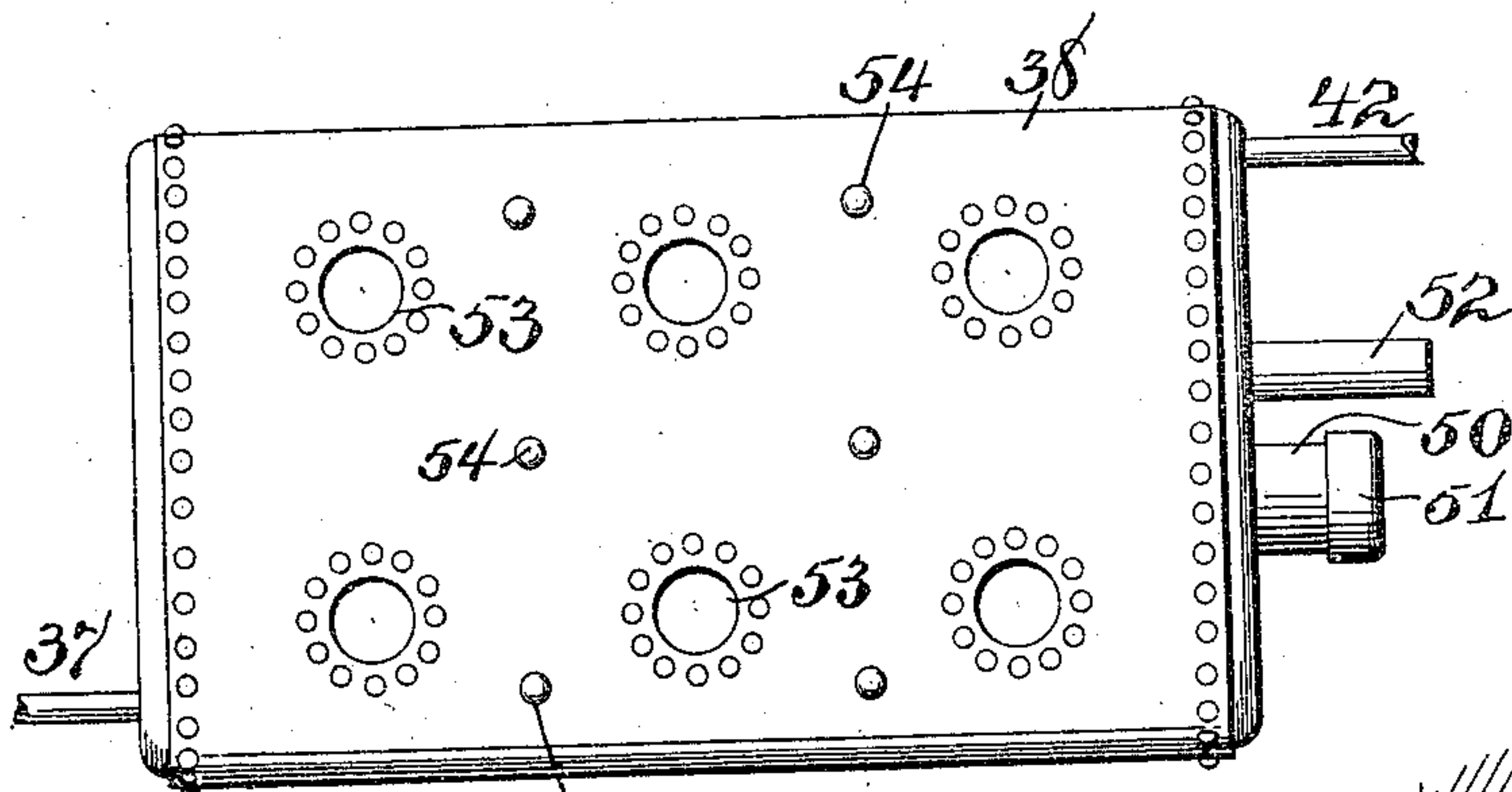


Fig. 3

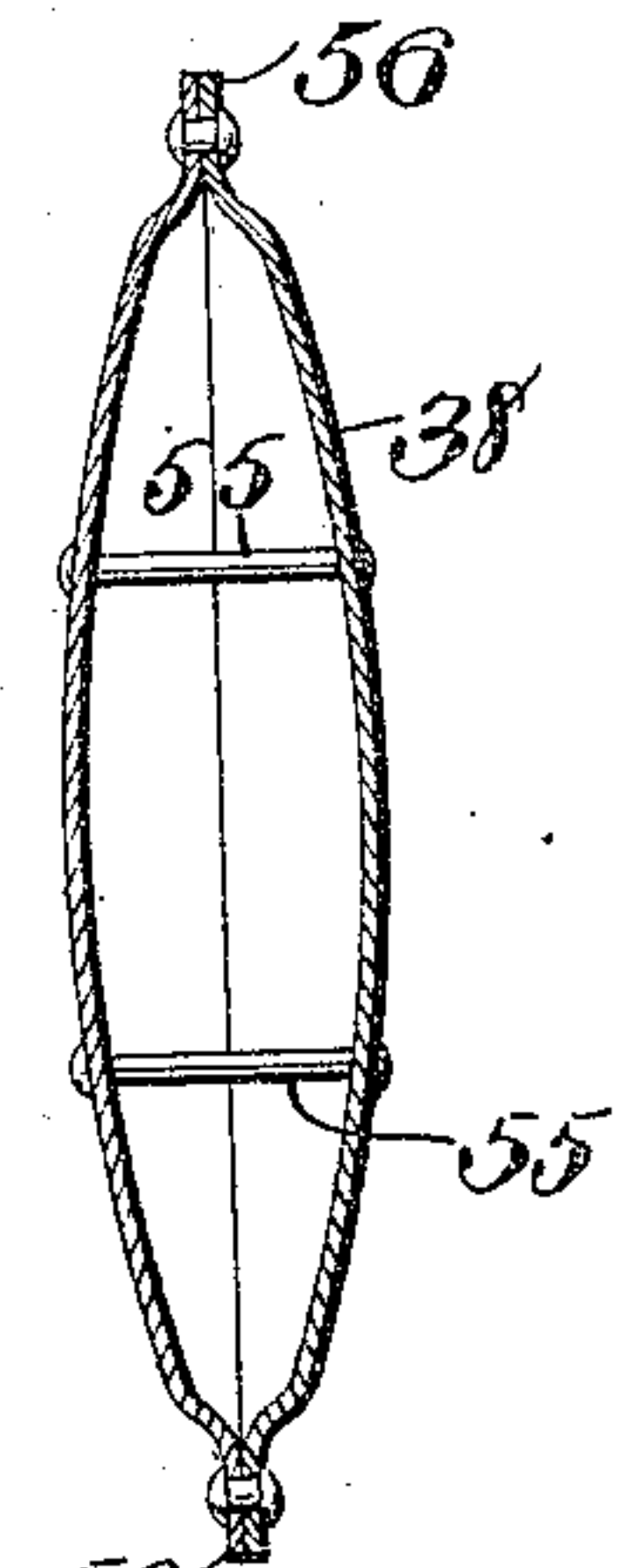


Fig. 4

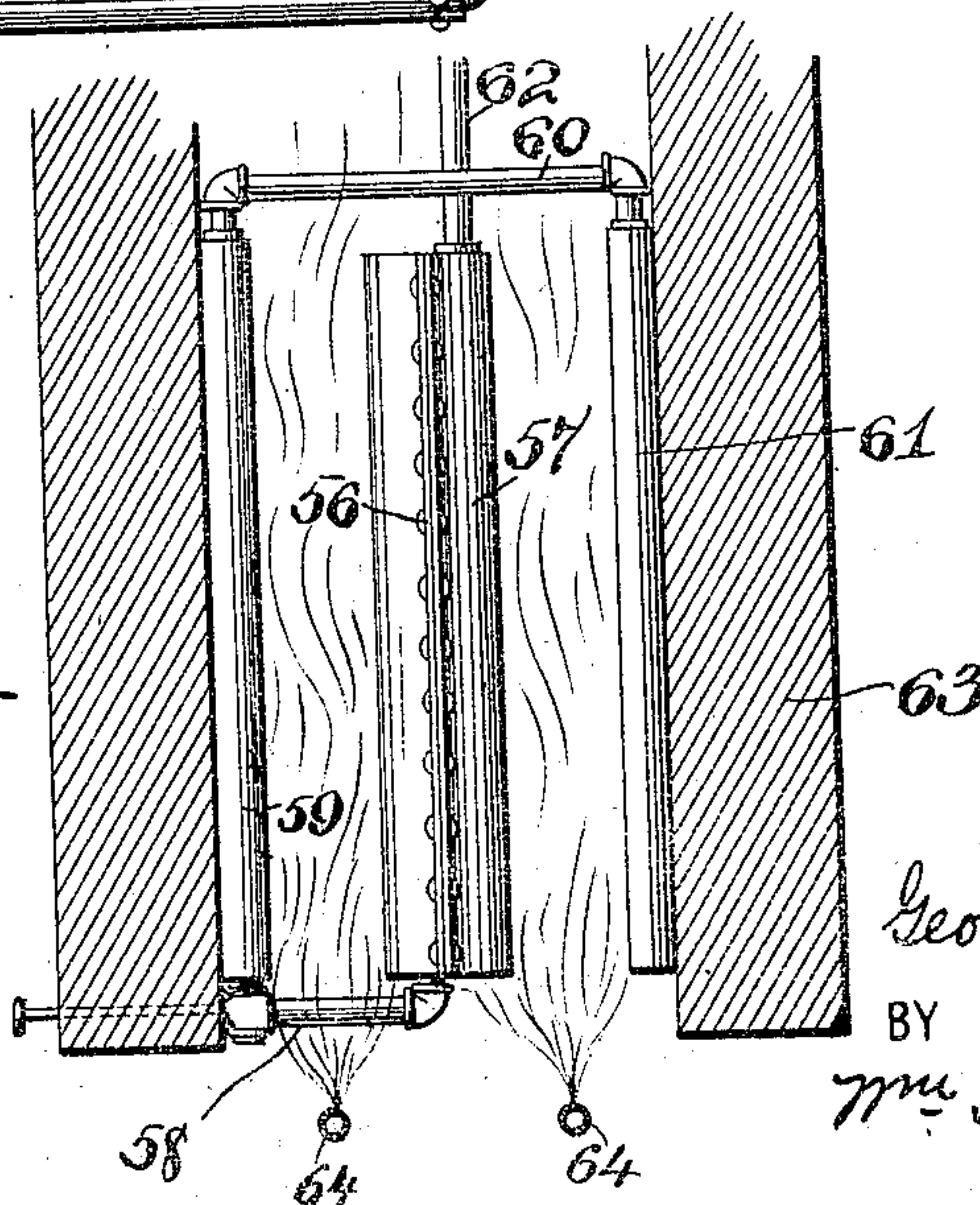


Fig. 5

WITNESSES:

M. A. Johnson.  
 E. A. Pell

INVENTOR

George von Ach,

BY

Wm. H. Campfield  
 ATTORNEYS



# UNITED STATES PATENT OFFICE.

GEORGE VON ACH, OF NEWARK, NEW JERSEY.

## APPARATUS FOR MAKING OXYGEN.

944,473.

Specification of Letters Patent. Patented Dec. 28, 1909.

Application filed July 20, 1909. Serial No. 508,616.

*To all whom it may concern:*

Be it known that I, GEORGE VON ACH, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Making Oxygen; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to figures of reference marked thereon, which form a part of this specification.

This invention relates to an improved apparatus for withdrawing the oxygen from the air and delivering it into suitable storage tanks or receptacles.

The apparatus is designed to be made so that it can be used by a physician to manufacture his own oxygen supply, and it can be installed in hospitals and the like to provide a quick and simple means of securing oxygen when needed.

The device embodies further a furnace in which the air is heated before it is purified and is again heated to withdraw the oxygen therefrom, the excess heat from the burners in the furnace heating the air on its way to the purifying apparatus.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic view of the apparatus, and Fig. 2 is a section of the furnace taken on line 2, 2, in Fig. 1. Fig. 3 is a top view of one form of retort employed in the apparatus. Fig. 4 is a section of a modified form of retort, and Fig. 5 is an elevation partly in section illustrating another arrangement of the retort and pipe coils which are used in conjunction therewith.

The inlet pipe 10 takes the air from any point where it is desirable to install the pipe and conducts it to a cylindrical heater or receptacle 11 which is installed at the top and on the inside of a furnace 12 which will be described hereinafter, and the receptacle 11 receives the excess heat from burners 13 which may be of any usual construction, but are preferably gas-burners. After being heated the air passes from the receptacle 11 to a pipe 14 down which it passes, passing a valve 15 and into a box or similar structure 16, which box is either made up of or lined with sheet iron and contains lime. The box is air tight and the moisture in the air is

absorbed by the lime, the best arrangement being as shown in Fig. 1 with the pipe 14 passing to near the bottom of the box 16, the air being conducted from the box 16 by a pipe 17 which in turn leads to near the bottom of a holder 18. The holder 18 contains caustic soda and on this account is usually lined with lead. The pipe 19 conducts the air, which is now nearly purified to the proper degree of purity, and leads it into the pipe 20 through valves 45 and 74 from which it passes into the pipe 21 which is connected to the pump 21<sup>a</sup> which is a pressure and vacuum pump, according to the desire of the operator, and is used to draw the air through the receptacle 11 and the connecting pipes and through the box 16 and the holder 18, and then pass it out through the pipe 22 into a reservoir 23, the pipe 22 being provided with a valve 24, the uses of which will be described hereinafter.

The reservoir 23 has a gage 25 thereon and has an outlet pipe provided with a pressure regulator 26, which regulator permits the air passing into the remainder of the system to have a predetermined pressure, and it has been found that the most satisfactory pressure is about seventeen pounds. The air then passes into a tube 27 which I fill with sponges to further dry the air and to prevent oil from the pump from being transmitted, and then through the pipe 28 into the cylinder or similar structure 29 which is in turn provided with a pressure gage 30 and is adapted to be filled with lime. A pipe 31, provided with a valve 32, then conducts the air from the cylinder 29 to a regulator 33 similar to the regulator 26. A pipe 34 then conducts the air to the retorts which are in the furnace below the receptacle 11 and passes along in the shape of a larger pipe 35 and then is passed back and forth, horizontally in the furnace, to form a coil 36, which coil is red hot, when the device is in operation, and will heat the air to a very high temperature. The air is thus well heated for its passage through the pipe 37 into the vessel 38, which vessel will be described more in detail hereinafter, and is designed to provide a receptacle for barium oxid or a similar substance or substances which are adapted to draw the oxygen from the air and absorb it when the air and the material are heated. The vessel is red hot from the flames of the burners 13 and the absorption of the oxygen permits the nitro-



gen to pass out through the pipe 42, past the valve 39 and escape through the check-valve 41 from which it either passes into the atmosphere or can be retained in a suitable receptacle. A pressure gage 40 keeps the operator posted on the pressure in the coil and the vessel in the furnace.

When sufficient oxygen is retained or absorbed by the barium oxid in the vessel 38, the valve 37<sup>a</sup> is closed, thus shutting off the vessel from the coils in the furnace. The pump 21<sup>a</sup> is now used to draw the oxygen from the vessel 38, the pipe 20 taking the oxygen from the pipe 42 through the valve 44 which has been opened, having been previously shut, the valve 45 in turn being shut after being opened in the previously described operation. In emerging from the pump, the oxygen, instead of passing through the pipe 22, takes another channel, because the valve 24 is closed and the oxygen is forced through a pipe 43 either into the pipe 46 to a suitable gasometer 47, or through the pipe 48 into a tank 49 where it is stored and by means of which it can be transported when transportation is necessary, the tank 49 being any of the usual commercial tanks now employed for this purpose.

The vessel 38 which is placed underneath the pipes as shown in Fig. 2 is preferably made of boiler iron or a suitable metal that is adapted to withstand the variations in temperature to which the vessel is subjected, and is formed preferably oblong, and in cross-section is elliptical. The vessel is disposed in the furnace so that the heat can pass around the sides thereof and is provided with sleeves or short pipes 53 which form flues which permit a more ready and complete heating of the vessel. To prevent collapsing or buckling of the vessel when under pressure or vacuum and heat at the same time, the tie-bolts 54 are arranged transversely of the sides of the vessel. Suitable pipe connections are arranged in each end for connecting the pipes 37 and 42 with the vessel, and the vessel has the neck 50 to surround an opening, the neck being provided with a cap or closure 51. The neck that the closure fits over is used to permit the insertion of barium oxid or similar chemical to the vessel, the formation of the vessel permitting a thorough heating of the oxid and forming the means for withdrawing the oxygen from the air. The pipe connections for the pipes 37 and 42 are arranged on opposite ends of the vessel, and preferably on opposite sides, so that the air is compelled to pass over the whole body of the barium oxid before it issues from the vessel.

A suitable inlet 52 is provided for the installation and insertion of a pyrometer which is shown installed in Fig. 1, the pyrom-

eter 66 being provided with the usual flexible connection 67 which in turn is connected to an indicator 68 whereby the heat in the vessel can be determined to permit of its regulation. When the oxygen is being drawn from the vessel, through the pipe 42, the gage 40 is shut off from the pipe by means of its valve, the check valve 41 automatically closes, and the vacuum gage 65 is connected to the pipe by having its valve opened, and in this way the vacuum can be determined.

If desired, I may make the vessel 38 as shown in Fig. 4, being made in halves which are provided with the flanges 56, these flanges being riveted closely together to form an air tight closure, the vessel being connected from side to side by suitable tie-rods or bolts 55. In Fig. 5 I illustrate a modified form of arranging the vessel and the pipes in a furnace, the furnace 63 being provided at its bottom with any kind of gas or other burner 64, and between but above the burners is arranged a vessel 57 similar to the vessel 38 of the previous structure, the vessel 57 being adapted to receive barium oxid or a similar substance. From a pipe 58 air is fed from a coil of pipe 59 between which and one wall of the vessel 57 a flue is formed, the coil 59 being fed by a pipe 60 which leads from another coil 61 on the opposite side of the vessel 57 from the coil 59, thereby forming another flue. The coil 61 receives its supply from the usual purifying apparatus. A pipe 62 is adapted to lead the oxygen from the vessel 57.

As shown in Fig. 1 I may, if desired, install a pipe 69 leading into the pipe 34, which pipe 69 leads from a suitable boiler or source of steam supply and is designed to inject steam along with the air when sodium manganate is used in the vessel instead of barium oxid.

When oxygen has been stored in the gasometer, and it is desired to place it into the receptacle 49, the valve 74 in pipe 19 is closed and the valve 44 is closed, but valves 45 and 73 are open, and in this way oxygen can be pumped from the gasometer through the pipes 72, 19 and 20 and through the pump into the pipe 43. The valve 71 is shut and the oxygen passes through the pipe 48 and the valve 70 into the receptacle 49.

This apparatus is positive in its operation, is simple to manage, and is adapted to provide an apparatus that has a good capacity for its size.

Having thus described my invention, what I claim is:—

1. An apparatus for extracting oxygen from air comprising a furnace, a vessel in the furnace containing material to absorb oxygen, a purifying apparatus, a pump, connections between the pump and the vessel, connections between the pump and the purify-



ing apparatus, pipe connections from the vessel to the purifying apparatus, a tank for receiving oxygen, connections from the pump to the tank, and means for conducting  
 5 air from the atmosphere to the purifying apparatus, the said conducting means passing through the furnace for heating the air before it enters the purifying apparatus.

2. An apparatus for extracting oxygen  
 10 from air comprising a furnace, a vessel in the furnace containing material to absorb oxygen, a purifying apparatus, a pump, pipe connections between the pump and the vessel, connections between the pump and the  
 15 purifying apparatus, pipe connections from the vessel to the purifying apparatus, valves in the connections, the connections between the vessel and the purifying apparatus being formed into a coil above the vessel to receive  
 20 the waste heat therefrom, a tank for receiving oxygen, connections from the pump to the tank, and means for conducting air from the atmosphere to the purifying apparatus, the said conducting means passing through  
 25 the furnace for heating the air before it enters the purifying apparatus.

3. An apparatus for extracting oxygen from air comprising a furnace, a vessel in the furnace, the vessel having an opening  
 30 for the insertion of material, the vessel being elliptical in cross-section, a purifying apparatus, a pump, connections between the pump and the vessel, connections between the pump and the purifying apparatus, pipe  
 35 connections from the vessel to the purifying apparatus, a tank for receiving oxygen, connections from the pump to the tank, and means for conducting air from the atmosphere to the purifying apparatus, the said  
 40 conducting means passing through the furnace for heating the air before it enters the purifying apparatus.

4. An apparatus for extracting oxygen from air comprising a furnace, a vessel in  
 45 the furnace, the vessel having a substantially broad and flat shape, the vessel having an opening on one end for the insertion of material, a closure for the opening, tubes passing through the vessel to permit the passage  
 50 of heat, a purifying apparatus, a pump, connections between the pump and the vessel, connections between the pump and the purifying apparatus, pipe connections from the vessel to the purifying apparatus, a tank for  
 55 receiving oxygen, connections from the pump to the tank, and means for conducting air from the atmosphere to the purifying apparatus, the said conducting means passing through the furnace for heating the air be-  
 60 fore it enters the purifying apparatus.

5. An apparatus for extracting oxygen from air comprising a furnace, a vessel in the furnace, the vessel having a substantially  
 65 opening on one end for the insertion of ma-

terial, a closure for the opening, tubes passing through the vessel to permit the passage of heat, a tube for the reception of a pyrometer, a pyrometer in said vessel, an indicator for the pyrometer, a purifying apparatus, a pump, connections between the pump  
 70 and the vessel, connections between the pump and the purifying apparatus, pipe connections from the vessel to the purifying apparatus, a tank for receiving oxygen, connections from the pump to the tank, and  
 75 means for conducting air from the atmosphere to the purifying apparatus, the said conducting means passing through the furnace for heating the air before it enters the  
 80 purifying apparatus.

6. In an apparatus for extracting oxygen from air, a vessel for containing material for absorbing oxygen of a substantially ob-  
 long shape and elliptical in cross-section  
 85 having connections at opposite sides of its opposite ends, the vessel having an opening for the insertion of material into the vessel, a closure for the opening, and tie-bolts connecting the sides of the vessel.  
 90

7. In an apparatus for extracting oxygen from air, a vessel of a substantially oblong shape and elliptical in cross-section having  
 connections at opposite sides of its opposite  
 95 ends, an opening for the insertion of material in the vessel, a closure for the opening, tie-bolts connecting the sides of the vessel, the vessel having its sides perforated in line, and pipes connecting the perforations on op-  
 100 posite sides to form passages for heat.

8. An apparatus for extracting oxygen from air comprising a furnace, a vessel in the furnace containing material to absorb oxy-  
 gen, a purifying apparatus, a pump, pipe  
 105 connections between the pump and the vessel, connections between the pump and the purifying apparatus, pipe connections from the vessel to the purifying apparatus, valves in the connections, a gasometer, pipe con-  
 110 nections from the gasometer to the pump, a tank for receiving oxygen, connections from the pump to the tank, and means for conducting air from the atmosphere to the purifying apparatus, the said conducting means passing through the furnace for heating the  
 115 air before it enters the purifying apparatus.

9. An apparatus for extracting oxygen from air comprising a furnace, a vessel in the furnace containing material to absorb  
 oxygen, a purifying apparatus, a pump, pipe  
 120 connections between the pump and the vessel, connections between the pump and the purifying apparatus, pipe connections from the vessel to the purifying apparatus passing through the furnace whereby they are  
 125 subjected to heat, valves in the connections, the connections between the vessel and the purifying apparatus being formed into a coil above the vessel to receive the waste heat therefrom, a tank for receiving oxygen, 130



connections from the pump to the tank, and means for conducting air from the atmosphere to the purifying apparatus, the said conducting means passing through the furnace for heating the air before it enters the purifying apparatus.

5 In testimony, that I claim the foregoing, I

have hereunto set my hand this 13th day of July 1909.

GEORGE VON ACH.

Witnesses:

WM. H. CAMPFIELD,  
E. A. PELL.