

No. 756,521.

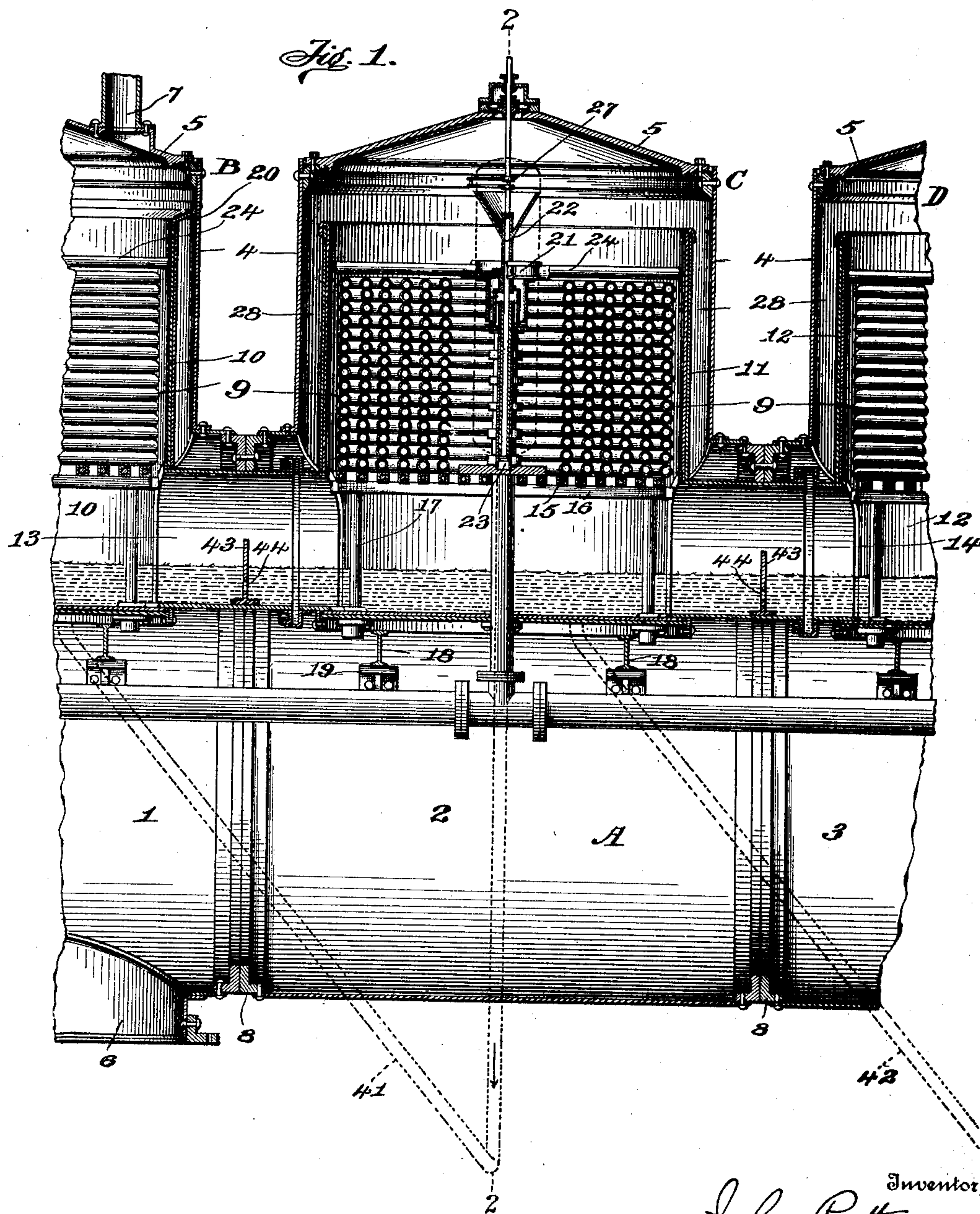
PATENTED APR. 5, 1904.

J. PATTEN.  
VAPOR ABSORBER.

APPLICATION FILED JULY 9, 1901.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses  
*Fenton S. Belt,*  
*Chas. W. Clement.*

Inventor  
*John Patten*  
By *Watson & Watson*  
Attorneys.

No. 756,521.

PATENTED APR. 5, 1904.

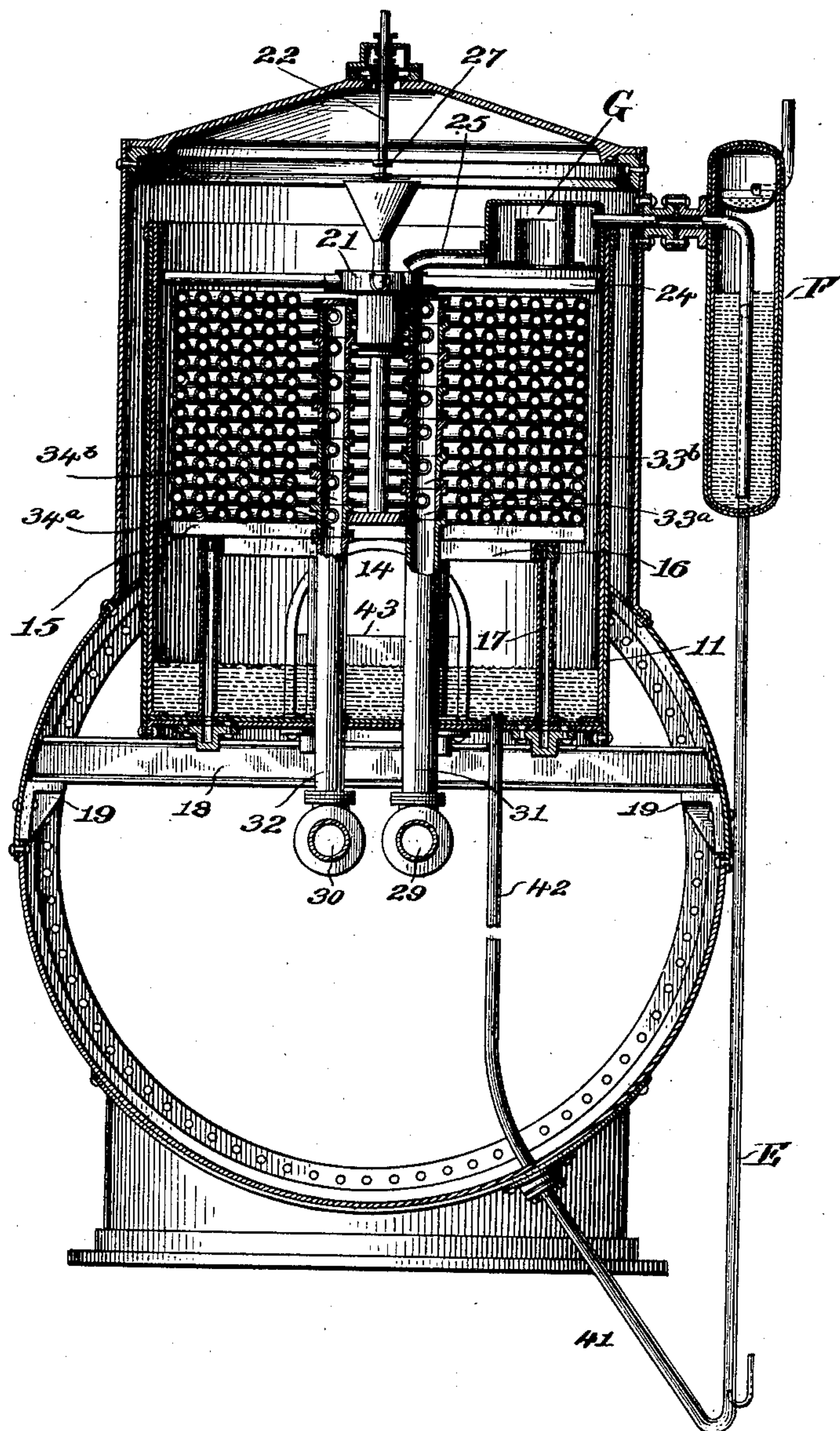
J. PATTEN.  
VAPOR ABSORBER.

APPLICATION FILED JULY 9, 1901.

NO MODEL.

3 SHEETS—SHEET 2.

*Fig. 2.*



Witnesses  
*Frederick W. Bilt,*  
*G. W. Clement.*

Inventor  
*John Patten*  
By *Watson & Watson*  
Attorneys.



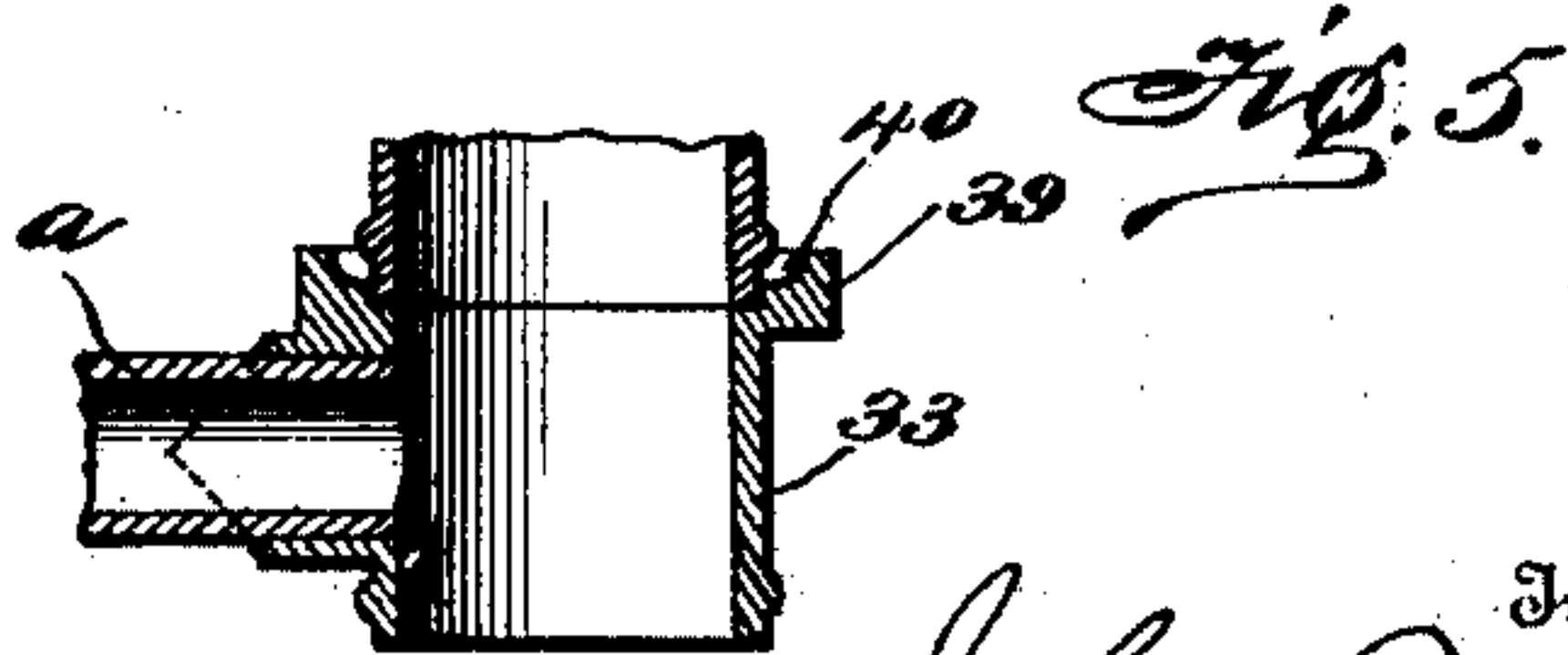
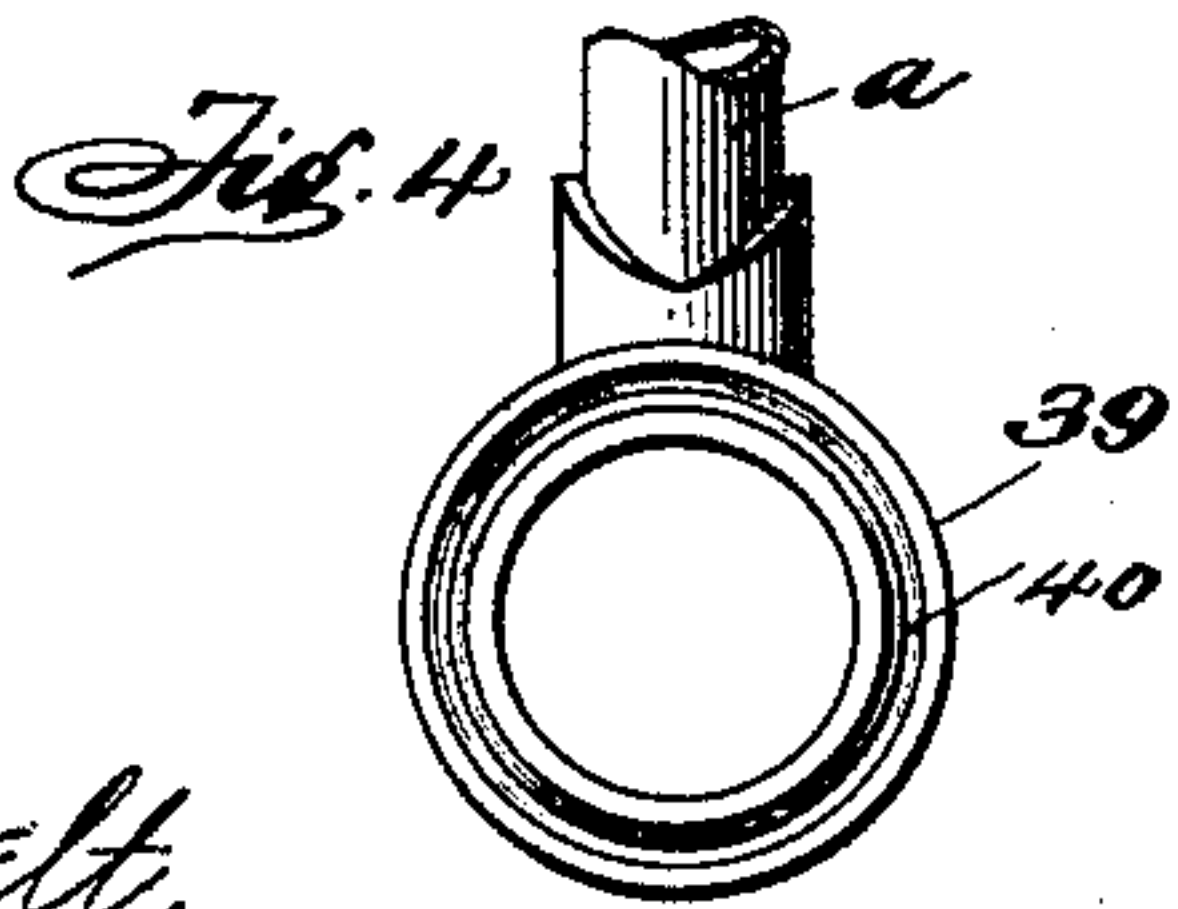
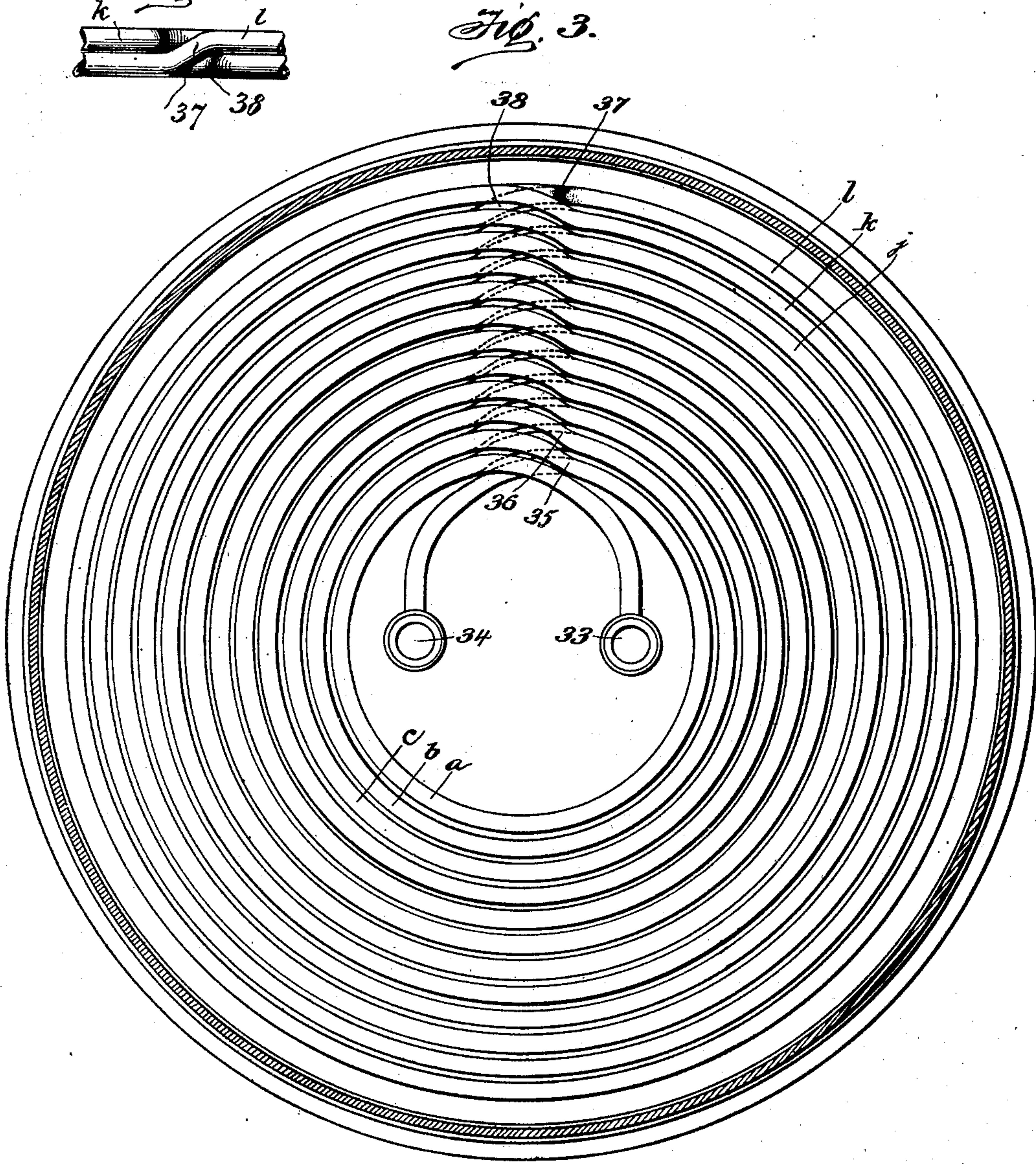
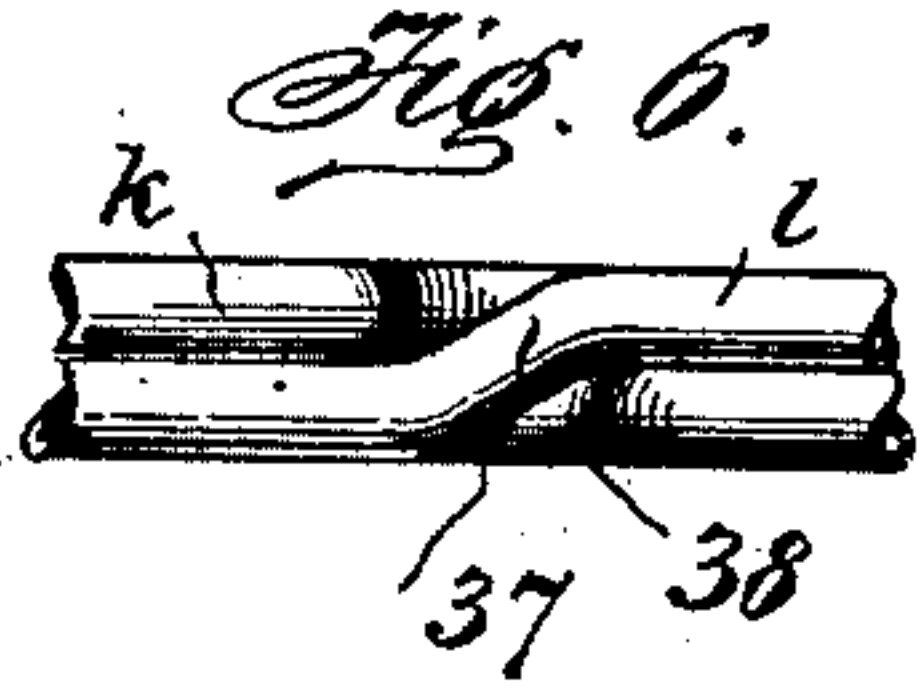
No. 756,521.

PATENTED APR. 5, 1904.

J. PATTEN.  
VAPOR ABSORBER.  
APPLICATION FILED JULY 9, 1901.

NO MODEL.

3 SHEETS--SHEET 3.



Witnesses  
Fenton St. Belt,  
C. W. Clement

Inventor  
John Patten  
By Watson & Watson  
Attorneys



# UNITED STATES PATENT OFFICE.

JOHN PATTEN, OF NEW YORK, N. Y.

## VAPOR-ABSORBER.

SPECIFICATION forming part of Letters Patent No. 756,521, dated April 5, 1904.

Application filed July 9, 1901. Serial No. 67,665. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN PATTEN, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Vapor-Absorbers, of which the following is a specification.

This invention relates to improvements in vapor-absorbers of the class shown in my Patent No. 676,665, dated June 18, 1901, and designed particularly for use in connection with ice-making and refrigerating apparatus in which water is frozen or cold produced by rapid evaporation. The air, gases, and aqueous vapor from the freezing-chamber are drawn off by means of an exhaust-pump, and the absorbers are placed between the freezing-chamber and the pump for the purpose of absorbing the aqueous vapor.

The principle of operation of the present invention is the same as that illustrated and described in the patent referred to; but the present invention includes various improvements in the apparatus involved.

The invention comprises an improved arrangement of the cooling-coils and their connections with the water supply and delivery pipes whereby the coils may be easily drained when not in use, a greater cooling-surface is provided, and the connections with the water-pipes are more easily and mechanically made than in the construction shown in said patent.

The apparatus is also designed for greater convenience of access to its parts and for joining the absorbers together in such manner that they will receive the vapor from one source.

In the accompanying drawings, which illustrate the invention, Figure 1 is a longitudinal vertical section through a series of absorbers connected together. Fig. 2 is a cross-section on the line 2 2, Fig. 1. Fig. 3 is a horizontal section through one of the absorber-tanks, showing a plan view of the coils and the fittings which connect them with the water-pipes. Fig. 4 is a plan view, and Fig. 5 is a sectional view, showing the construction of the fittings which connect the cooling-coils to

the water-pipes; and Fig. 6 is a side view of portions of the outer sections of a coil, showing the bend connecting the upper and lower layers.

Referring to the drawings, A indicates a tubular casing or trunk, which, as shown, is preferably made in sections 1 2 3, &c., each section having a branch 4 and a cover 5, said branches thus forming domes B C D, &c. This casing is interposed between the refrigerating-chamber and an exhaust-pump, being connected to the former by an inlet-opening 6 and to the exhaust-pump by an outlet-opening 7 in the cover of the dome B. The sections are preferably made of rolled metal having cast flanges 8 at the ends, which unite with similar flanges upon the adjoining sections. Within each of the domes is a system of circularly-arranged lead cooling-coils 9, and surrounding the coils within the domes B, C, and D are lead-lined tanks 10, 11, and 12, respectively, said tanks 11 and 12 being separated from the vertical walls of the dome in order to provide passage-ways 28 for the vapor between the tanks, and the walls of the dome and the tank 10 being united to the dome at its upper end 20 to prevent the vapor from passing upwardly between the dome and tank. The lower ends of the several tanks are connected by communicating passage-ways or pipes 13 14, &c., arranged within the horizontal portion of the casing, these passage-ways being of sufficient size to permit a man to pass through from one tank to the other. The tanks, passage-ways, and all other parts of the apparatus which come in contact with the acid which absorbs the vapors are either formed of lead or lined with lead. The coils 9, as shown, are supported upon lead-covered grate-bars 15, which are carried upon a lead-covered ring 16, the latter being supported by pillars 17, also covered with lead. The pillars, tanks, and various parts within the domes are suitably supported upon horizontal beams 18, which rest upon brackets 19 within the casing. The upper end 20 of the tank 10 is joined to the side of the dome, as shown, in order to prevent the vapor from passing upward between said tank



and the wall of the dome. With this construction it will be seen that the vapor entering through the inlet-opening 6 will pass through the horizontal portion or trunk of the casing, thence upward between the tanks 11 and 12 and the walls of the domes C and D, thence downwardly about the coils in said tanks, and through the passage-ways 13 and 14 to the tank in the dome B. In this tank the unabsorbed vapor and gases from all the other absorbers in the system pass upwardly through the coils and thence through the outlet 7 to the exhaust-pump. During the passage of the vapor through the casing sulfuric acid or other suitable vapor-absorbing fluid is sprayed upon the coils, and water is circulated through the coils in order to keep the acid cool and effective. The greater part of the vapor is thus absorbed during its passage through the coils, as described in my patent hereinbefore referred to. As the unabsorbed vapor, air, and gases from all of the other absorbers in the system pass through the absorber in the dome B, the flow of vapor through said absorber will be quite rapid, and it is found in practice that the vapors are more readily absorbed when the flow through the coils is rapid.

The spraying apparatus in each absorber is substantially the same as that shown in said patent and consists of a pan 21, mounted upon a vertical lead-covered shaft 22, which rests upon a step-bearing 23, supported upon the transverse bars 15 in the center of the system of coils. This pan is provided with radial trough-like arms 24, having perforations through which the acid passes from said arms to the uppermost coils and from thence trickles downward over the vertically-arranged coil-sections. The pan and arms are lead-covered. The shaft 22 extends through the cover of the dome and is constantly rotated by power applied externally. Acid is supplied to the distributing-pan in the first absorber in the series directly from the concentrator and to each subsequent absorber by means of an atmospheric pump E, which delivers the acid to the pan through air-separators F and G and pipe 25, these parts being substantially the same as those shown in my prior patent referred to. For convenience in removing the cover the shaft is made in two parts and connected by a suitable coupling 27.

As shown in Figs. 1 and 2, a water-supply pipe 29 and a return-pipe 30 extend longitudinally through the trunk, and branch pipes 31 and 32 extend upwardly from the supply and return pipes, respectively, into the central portions of the tanks, terminating at the bottoms of the coils. These branch pipes may be made of lead or covered with lead. Each coil, as shown in Fig. 3, comprises two layers, each layer consisting of a series of circular turns or sections, the sections in one layer be-

ing superposed upon the corresponding sections in the other layer. Tubular fittings or T's 33 and 34 are attached to the terminals of the coil, and these fittings are adapted to form continuations of the branch pipes 31 and 32, respectively, when the coils are in position. The coil-sections are not in the form of a spiral, but are concentrically arranged, so that the openings in the rotatable arms 24 of the acid-distributor will be directly over the coil-sections throughout the revolution of the arms. The coils are all alike, and a description of one will therefore answer for the entire series. As shown in Fig. 3, the inner turn or section *a* of the upper layer is connected to the T-fitting 33 and describes a circle to the point 35, where the pipe is offset outwardly for a distance slightly greater than its diameter, and thence continues in a circle to form the section *b*, at the end of which the pipe is again offset, as shown at 36, and so on until the outer circular section *l* is formed, the offset portions being all in the same radial position. At the end of the section *l* the pipe is bent downwardly, as shown at 37, to bring it beneath the upper section *l*, and after making a complete circle beneath said section it is offset inwardly, as shown at 38, to bring it beneath the section *k*, and so on until the two series of circular sections are complete, the end of the lower layer terminating at the fitting 34. The fittings upon the ends of the pipe-coils when in place form continuations of the vertical water-pipes. For this purpose each fitting is formed with a bell-mouth 39 upon its upper end, adapted to receive the lower end of the adjoining fitting, and these fittings are connected together in a water-tight and air-tight manner by lead, which is burned into the recess 40 between each pair of fittings. The fittings 33<sup>a</sup> and 34<sup>a</sup> on the lowermost coil are connected by bell-joints to the upper ends of the vertical water-pipes 31 and 32, respectively, as shown in Fig. 2, and the fittings 33<sup>b</sup> 34<sup>b</sup>, &c., on the successive coils are built upwardly upon one another, as clearly shown in said figure, the topmost fittings being closed at their upper ends. It will be evident that water entering through the branch pipe 31 will pass into the tier of fittings 33<sup>a</sup> 33<sup>b</sup>, &c., and from thence after circulating through the upper and lower layers of the coils successively will return to the fittings 34<sup>a</sup> 34<sup>b</sup>, &c., and thence through branch pipe 32 to the return-pipe 30. The pipe 32 is shorter than the pipe 31, and the fittings which are connected to the terminals of the lower layers of the coils are, as shown, lower than the fittings upon the upper layers. This arrangement of coils and fittings permits the water to drain from the coils when the water is withdrawn from the water-pipes, and hence prevents freezing and bursting of the coils in cold weather when the apparatus is not in use. The coils are substantially horizontal, and if



it is desired to drain them completely air may be blown into the pipe 30, which will force out all of the water. In the patent herebefore referred to the ends of the coils were raised above the bodies of the coils, and hence the latter were difficult to drain. In the present improvement this difficulty is overcome, and the arrangement of fittings and connections to the water-pipes is more desirable. A greater cooling-surface is also provided by the present arrangement of the coils, and the parts are easily accessible for repairs or alterations by reason of the fact that the passage-ways between the tanks are large enough to permit a person to pass through them and into the various tanks.

The vapor-absorbing fluid passes successively through the entire series of absorbers and is then carried to a concentrator, where the vapor is driven off, and the concentrated fluid is then returned to the first absorber in the series. The concentrator and circulating system are not shown in the present case. The concentrated acid which is sprayed upon the coils in the tank 10 is conveyed through a pipe 41 to the distributing-pan in the tank 11 by means of an atmospheric pump or lift E. (Shown in Fig. 2 and fully described in my prior patent.) After passing over the coils in tank 11 and into the bottom of said tank the acid is conveyed in a similar manner through a pipe 42 to the distributing-pan in the tank 12, and so on through the entire series of absorbers. The acid is then carried off to the concentrator and subsequently returned to the first absorber in the series. The several tanks being connected at the bottom into one common receptacle, the acid remains at the same height in each tank, and hence if one air-lift should work more rapidly than another there will always be a supply of acid for each lift. The acid gradually becomes weaker as it is passed through the successive absorbers, and it is desirable to prevent the weaker acid from returning freely to the tanks containing stronger acid. For this purpose retarding-partitions 43 are arranged within the passage-ways between the tanks, and said partitions are provided with openings 44 large enough to permit the acid to flow through for the purpose of equalizing the depth of the acid in the various tanks, but not large enough to permit of a free circulation in both directions.

It is sometimes desirable to have the water run through two or more absorbers successively, so that the coolest water will be in the absorber containing the strongest acid, and vice versa. This may be accomplished by proper connection of the water-pipes.

It will be seen that the upper portions of the tanks surrounding the coils in the domes C and D serve as partitions to direct the vapors onto the coils, while the lower portions and the passage-ways between them form one

common receptacle for the acid and a conduit for the unabsorbed vapors, air, and gases which flow to the absorber B. The partitions in the passage-ways form convenient retarding devices for preventing the different grades of acid from mingling freely, and yet permit sufficient flow to maintain a constant supply of acid for the various atmospheric pumps.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an absorber the combination with water supply and exhaust pipes of a plurality of cooling-coils arranged in a vertical series, each coil comprising two series of circular sections arranged one above the other, the terminals of the coils being within the same and superposed.

2. In an absorber the combination with water supply and exhaust pipes of a cooling-coil comprising two series of circular sections arranged one above the other, the terminals of said coil being within the same, and T-fittings upon said terminals for connecting the latter to said pipes.

3. In an absorber the combination with supply and exhaust pipes of a plurality of cooling-coils arranged in a vertical series, each coil comprising two series of circular sections arranged one above the other, the terminals of each coil being within the same, and T-fittings upon said terminals, said fittings being arranged one upon the other and forming continuations of the supply and exhaust pipes.

4. The combination with a casing having vapor inlet and outlet openings and a series of vapor-absorbers within the casing, each comprising a cooling-surface and means for passing an absorbing fluid over said surface, of a receptacle for the absorbing fluid within the casing and common to said absorbers, and means for directing the vapor over the cooling-surfaces.

5. The combination with a casing having inlet and outlet openings for vapor and a series of vapor-absorbers within the casing, each comprising a cooling-surface arranged in the path of the vapor and means for passing absorbing fluid over said surface, of a receptacle having compartments arranged to receive the fluid from the several absorbers, means for permitting a limited flow of fluid between said compartments, and means for conveying the fluid from each compartment to the next absorber in the series.

6. The combination with a casing having inlet and outlet openings for vapor and a series of vapor-absorbers within the casing, each comprising a cooling-surface arranged in the path of the vapor and means for passing absorbing fluid over said surface, of a receptacle having compartments arranged to receive the fluid from the several absorbers respectively, partitions between said compartments having openings through which a limited flow of fluid



may take place, and means for conveying the fluid from each compartment to the next absorber in the series.

5 7. The combination with a casing comprising a trunk having a series of domes and vapor inlet and outlet openings, of cooling-coils within each dome, means for passing absorbing liquid over said coils, tanks surrounding said coils, passage-ways connecting the lower  
10 ends of said tanks, and means for conveying the liquid from each tank to the next absorber in the series.

15 8. The combination with a casing comprising a trunk having a series of domes and vapor inlet and outlet openings, of cooling-coils within each dome, means for passing absorbing liquid over said coils, tanks surrounding said coils, passage-ways connecting the lower ends of said tanks, partitions adapted to retard  
20 the flow of liquid through the passage-ways, and means for conveying the liquid from each tank to the next absorber in the series.

9. The combination with a casing having a series of domes and a vapor-inlet, of a series of absorbers within said domes, and tanks within said domes and surrounding said absorbers, said tanks being connected at their lower ends, and said casing having an outlet communicating with said series of tanks.

10. In a vapor-absorbing apparatus, a casing having a series of domes, tanks within said domes, and absorbers within said tanks, said tanks being connected at their lower ends and open at their upper ends, said casing having a vapor inlet and outlets through passages between the domes and tanks to direct the vapor to the absorbers.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN PATTEN.

Witnesses:

LEONARD A. DESSAR,  
FENTON S. BELT.