

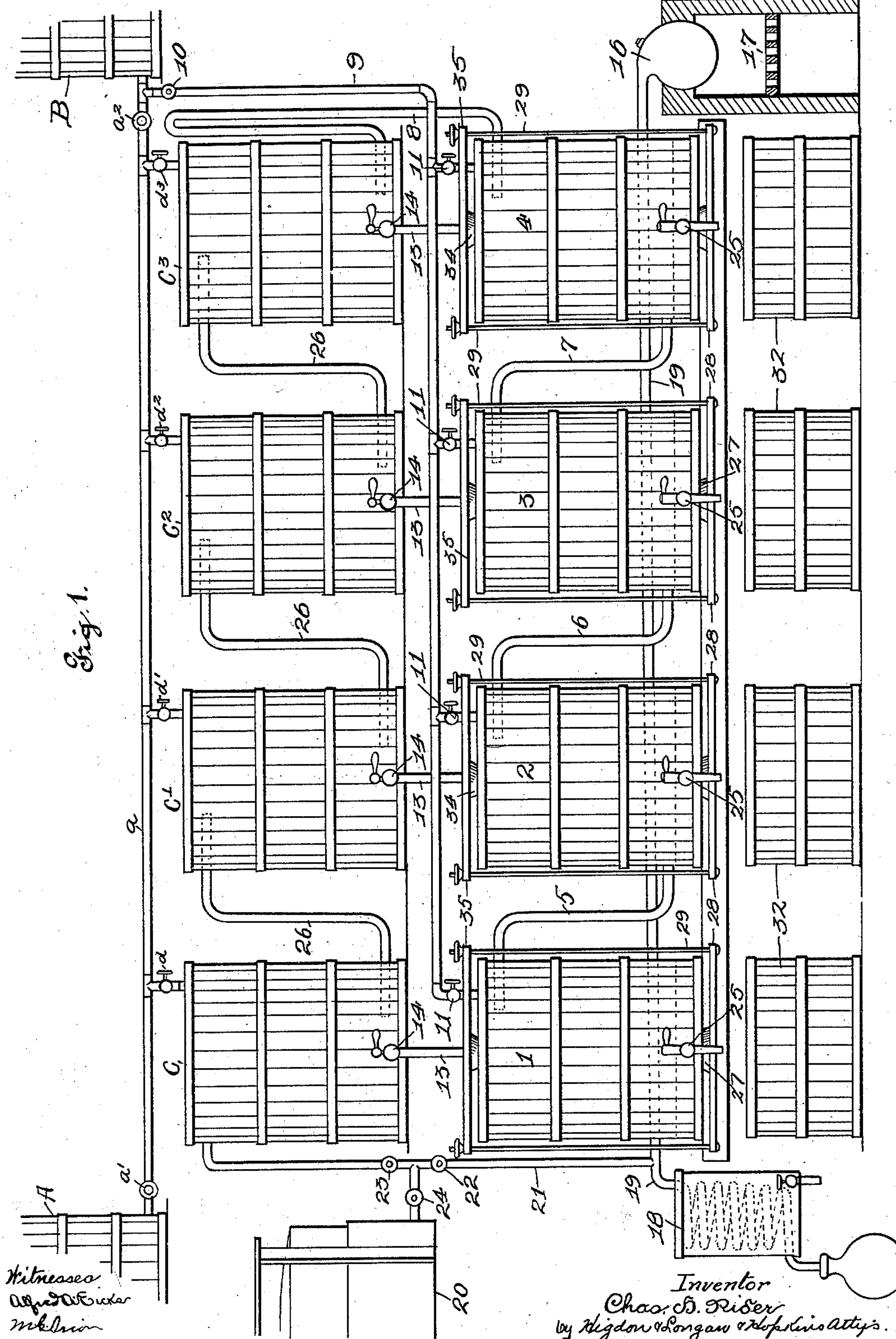
C. H. RIDER.

APPARATUS FOR DISSOLVING ORGANIC OR INORGANIC SUBSTANCES.

APPLICATION FILED MAR. 3, 1903. RENEWED NOV. 9, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



No. 748,217.

PATENTED DEC. 29, 1903.

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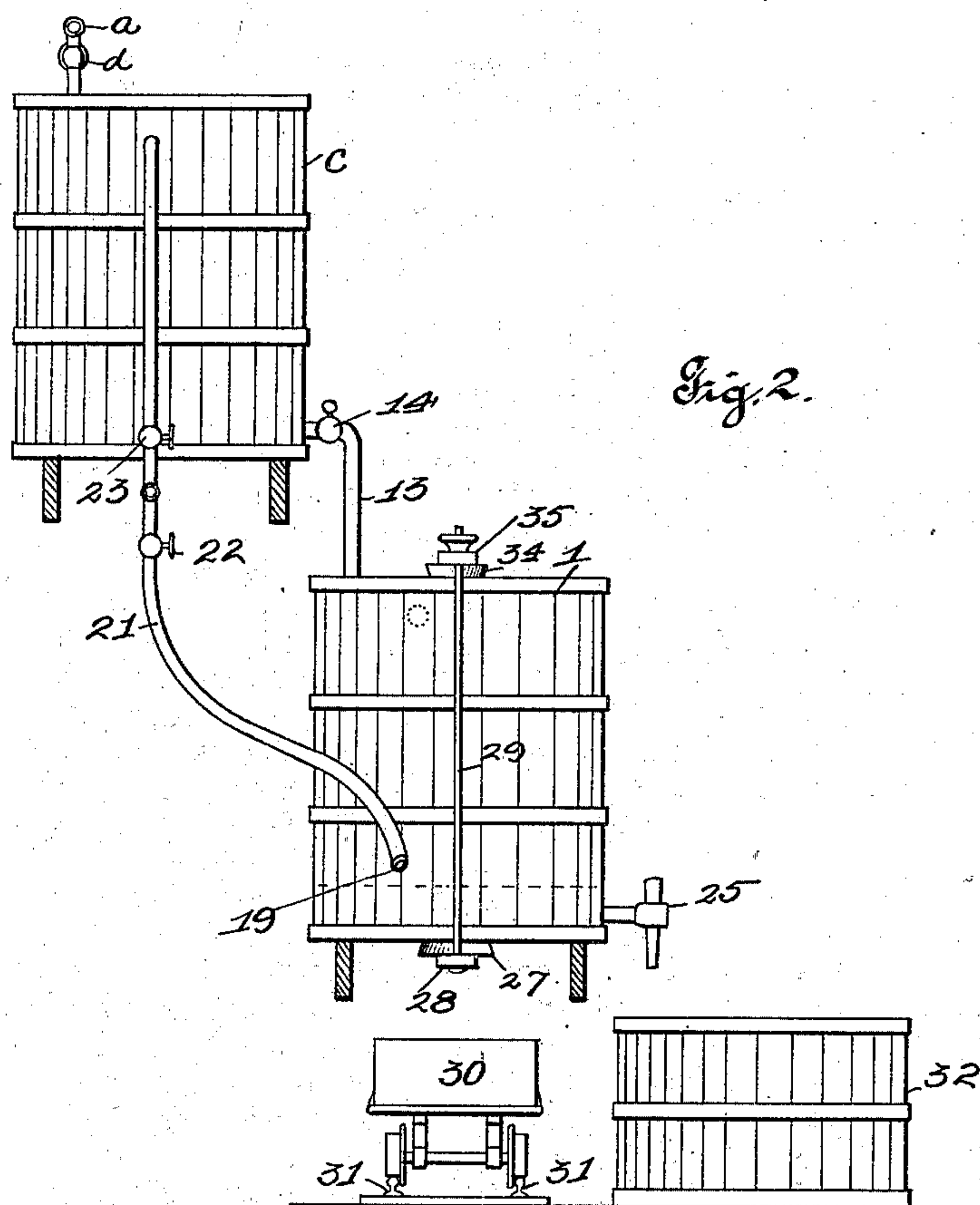
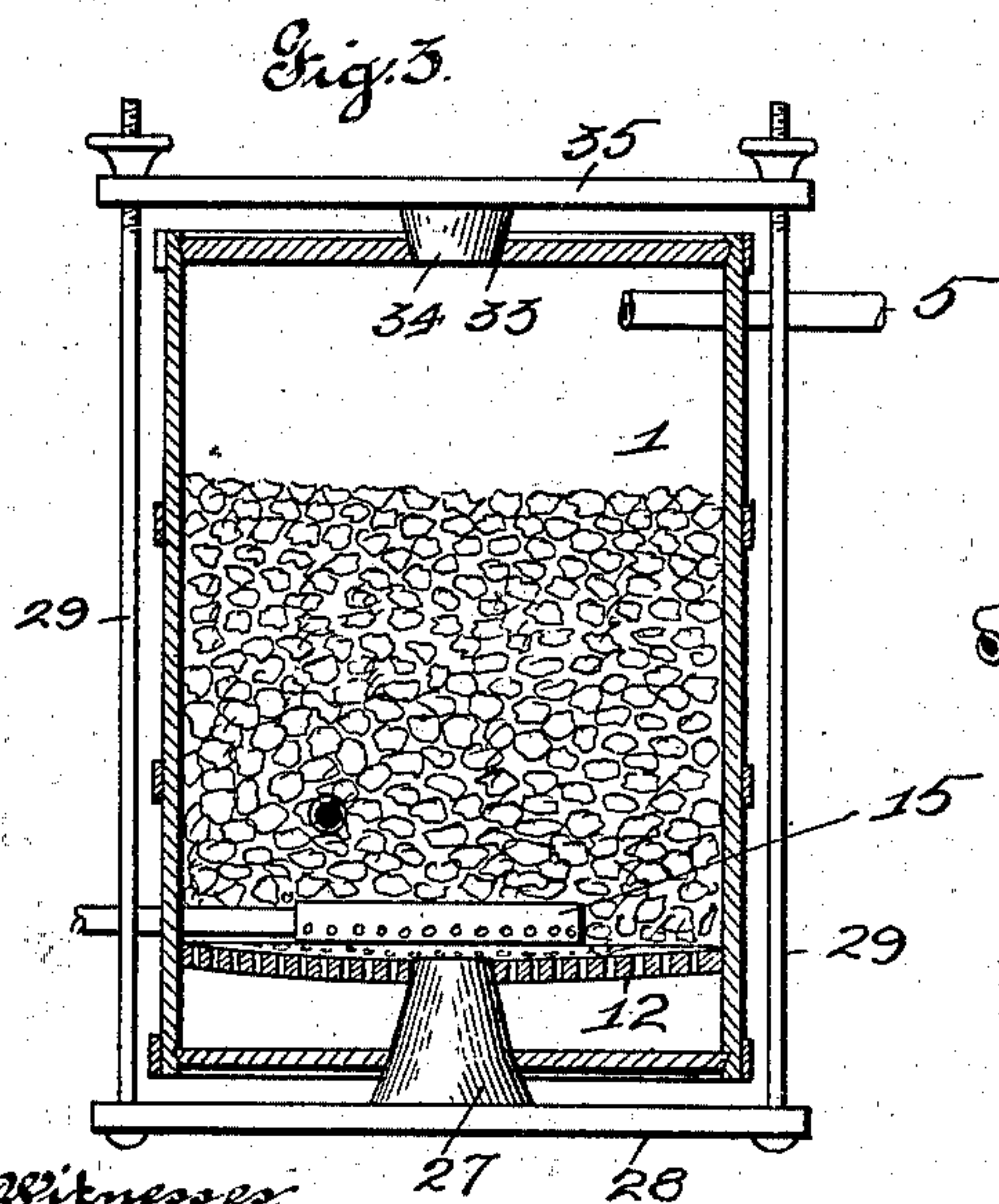


Fig. 2.



Witnesses  
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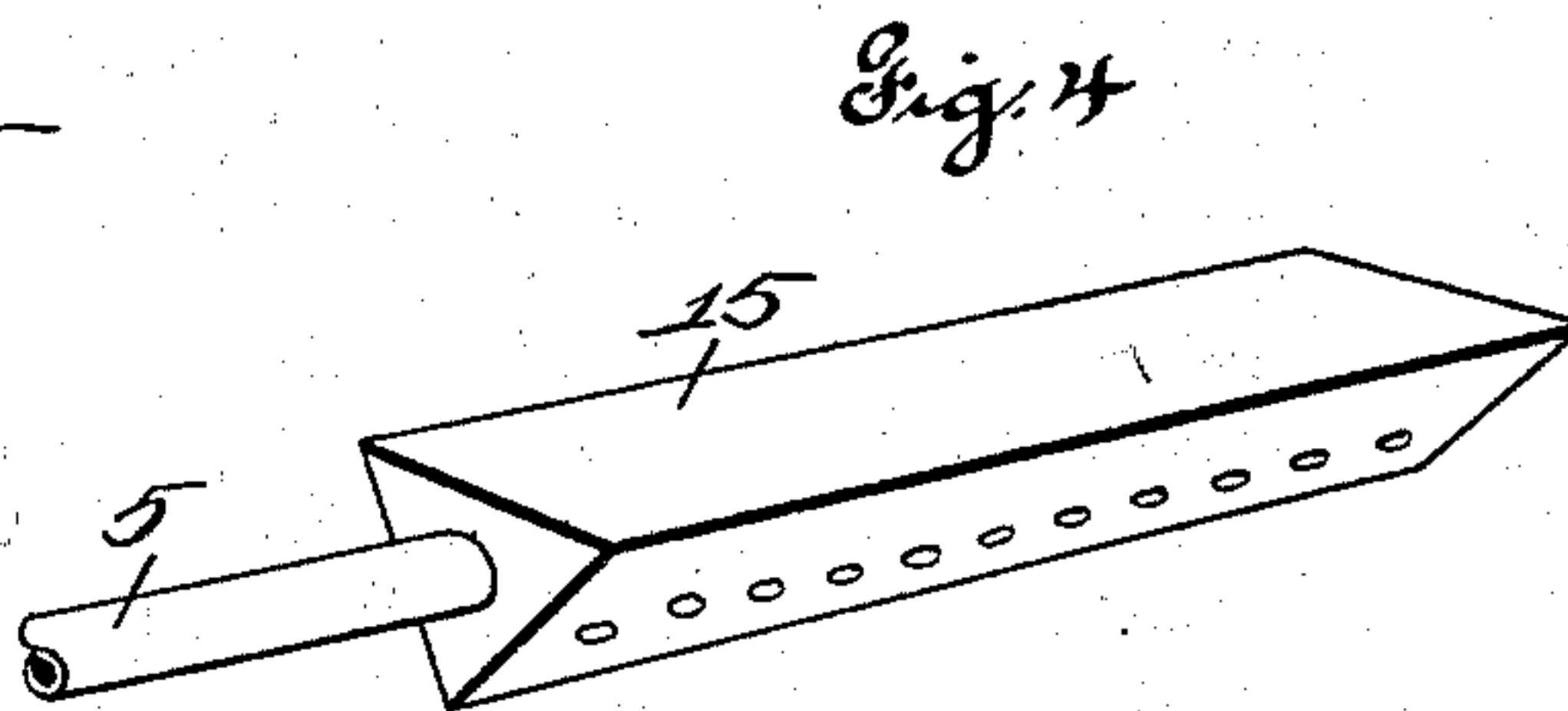


Fig. 4

Inventor  
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# UNITED STATES PATENT OFFICE.

CHARLES H. RIDER, OF ST. LOUIS, MISSOURI.

APPARATUS FOR DISSOLVING ORGANIC OR INORGANIC SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 748,217, dated December 29, 1903.

Application filed March 3, 1903. Renewed November 9, 1903. Serial No. 180,478. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES H. RIDER, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Apparatus for Dissolving, Filtering, Condensing, Evaporating, and Separating Organic or Inorganic Substances, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to improvements in apparatus for dissolving, filtering, condensing, evaporating, and separating organic and inorganic substances.

In the drawings which form a part of this specification, Figure 1 is a front view of an apparatus embodying my invention. Fig. 2 is an end view of the same. Fig. 3 is a vertical cross-section of one of the lower receiving-tanks of said apparatus. Fig. 4 is a perspective of the trilateral perforated gas-distributing tube mounted on the lower ends of the pipes 5.

In the drawings, A is an acid-tank. B is a water-tank. Beneath the level of the bottom of tanks A and B is a series of tanks C, C', C<sup>2</sup>, and C<sup>3</sup>. The tanks A and B are connected by the horizontal pipe *a*, which is provided with valves *a'* and *a<sup>2</sup>*. The tanks C, C', C<sup>2</sup>, and C<sup>3</sup> are connected with the pipe *a* by means of the valves *d*, *d'*, *d<sup>2</sup>*, and *d<sup>3</sup>*. By reason of the mechanism thus described it is possible to introduce to the tanks C, C', C<sup>2</sup>, and C<sup>3</sup> an acidulated mixture of any desired strength, the acidulated mixture from the tank A and water from the tank B being controlled by the various valves *a'*, *a<sup>2</sup>*, *d*, *d'*, *d<sup>2</sup>*, and *d<sup>3</sup>*.

Beneath the tanks C, C', C<sup>2</sup>, and C<sup>3</sup> are situated the tanks 1, 2, 3, and 4, which are connected together by means of the pipes 5, 6, and 7. The tank 4 is connected to the tank C<sup>3</sup> by means of the pipe 8. The tanks 1, 2, 3, and 4 are connected to the pipe *a* by means of the pipe 9, provided with the valves 10 and 11.

Both series of tanks heretofore described are kept air-tight during the process of dissolution.

The tanks 1, 2, 3, and 4 are provided with false bottoms 12. The acidulated mixture

from the tanks C, C', C<sup>2</sup>, and C<sup>3</sup> is admitted to the tanks 1, 2, 3, and 4 by means of the pipes 13, which are provided with the stop-cocks 14. Each of the pipes 5, 6, and 7 is provided at its lower extremity with a perforated gas-distributing tube 15.

At the side of the tank 4 the retort 16 is mounted above the furnace 17. The retort 16 is connected to the condenser 18 by means of the pipe 19, which passes through the tanks 1, 2, 3 and 4. The pipe 19 is connected to the tank C and the gasometer 20 by means of the pipe 21, which is provided with valves 22, 23, and 24. The tanks 1, 2, 3, and 4 are provided with the cocks 25. The tanks C, C', C<sup>2</sup>, and C<sup>3</sup> are connected by means of the pipe 26. The bottom of the tanks 1, 2, 3, and 4 are provided with the removable plugs 27, which extend upward and through the false bottoms 12 and are normally supported by the bars 28, which are held in position by means of the screw-rods 29. Beneath the tanks 1, 2, 3, and 4 I have provided the wheeled car 30 preferably running on the rails 31, as shown in Fig. 2. Beneath the stop-cocks 25 I have provided the vats 32.

The ore or other substance to be treated being crushed or ground is placed in the tanks 1, 2, 3, and 4 through the openings 33, which are provided with removable plugs 34, the removable plugs 34 being attached to cross-bars 35, normally held in position by the screw-rods 29. The dissolving fluid is formed in the tanks C, C', C<sup>2</sup>, and C<sup>3</sup>, as above described, the cocks 14 remaining closed. Sodium or potassium nitrate or a similar substance is then placed in the retort 16, and sulfuric or similar acid is also introduced into the retort 16. Heat is then applied to the retort 16 from the furnace 17. The dissolving mixture from the tanks C, C', C<sup>2</sup>, and C<sup>3</sup> is then admitted to the tanks 1, 2, 3, and 4 by opening the cocks 14. Sodium or potassium nitrate is placed in the retort, together with the necessary quantity of sulfuric acid of the proper strength for the purpose of generating nitric acid in the condenser 18, while at the same time, being heated by the furnace 17, the vapors from the retort 16 heat the connecting-pipe 19 sufficiently to raise the contents of the tanks 1, 2, 3, and 4 to the desired temperature. It is manifest



that any desired size of retort may be used, as Fig. 1 of the drawings is not drawn to a scale. Any suitable fluid may be used in the retort 16 and its vapors distilled in the condenser 18. Thus the apparatus is susceptible of many uses in which it is not desired to employ nitric or other acid within the tanks, in which event water may be used as the heating medium in the retort 16, and the steam will be condensed by the condenser 18, thus affording a convenient source of supply for the distilled water necessary in laboratory work. The gases and vapors generated by the application of heat to the retort 16 pass through the pipe 19 to the condenser 18, heating the pipe 19, and thus supplying heat to the substance contained in the tanks 1, 2, 3, and 4. The gases and vapor arising from the ore as they rise to the tops of tanks 1, 2, and 3 are gradually forced into and through the pipes 5, 6, and 7 to the bottoms of the adjacent tanks 2, 3, and 4, respectively. The excess of gases and vapor formed in the tanks 1, 2, and 3 is therefore finally forced into the tank 4 through the pipe 7 and is thence forced upwardly through the pipe 8 to the bottom of the tank C<sup>3</sup>. The metallic, acid, or other values contained in the gases and vapors thus discharged through the pipe 8 are forced to pass successively through the contents of the tanks C<sup>3</sup>, C<sup>2</sup>, C', and C by means of the connecting-pipes 26. The function of the tanks C, C', C<sup>2</sup>, and C<sup>3</sup> is therefore not only to receive and discharge the acidulated mixture used in the dissolution of the substance being treated, but also serves to condense and save the metallic or other values contained in mineral or other substances which are known to be sensitively volatile and which are lost when the substance is dissolved in an open receptacle. When the operation of dissolution is complete, the fluid matter in the tanks 1, 2, 3, and 4 is discharged into the vats 32 by opening the cocks 25. The remaining contents of the tanks 1, 2, 3, and 4 are then washed with water admitted from the tank B through the pipe 9 by opening the valves 11. Any excessive pressure of gas from the tanks 1, 2, 3, and 4, C, C', C<sup>2</sup>, and C<sup>3</sup>, or the retort 16 is accommodated by opening the valve 24 and permitting such excess to flow into the gasometer 20, thus preventing the waste of any of the gases or vapors generated during the use of my apparatus. When the ore in the tanks 1, 2, 3, and 4 has been completely decomposed by the action of the acids and vapors to which it has been exposed, the insoluble remainder is washed out of the said tanks by loosening the screw-rods 29 and removing the bar 28 and plug 27, thus permitting such contents to drop into the car 30. My apparatus is susceptible of and adapted to a great variety of uses. When used as

an evaporator, the substance to be evaporated will be placed in tanks 1, 2, 3, and 4, the valve 24 closed, and valves 22 and 23 opened. The heated discharge from the retort 16, passing through the pipe 19 past the base of the pipe 21, tends to create suction, and thereby form a partial vacuum in tanks C, C', C<sup>2</sup>, and C<sup>3</sup>, which for the purposes of this operation are used as condensers. During the process of evaporation the valves 11  $d$   $d'$   $d^2$   $d^3$  and stop-cocks 14 and 25 are closed.

Having thus described my invention, what I claim as new, and desire to have secured to me by the grant of Letters Patent, is—

1. A device of the class named, consisting of an acid-tank, a water-tank, an upper series of tanks connected with the acid-tank and the water-tank and to each other, a lower series of tanks adapted to receive the substance to be treated, connected to the upper series of tanks and to the water-tank and to each other; a retort, means for heating the retort, a pipe passing from the retort through the lower series of tanks, and a condenser into which the last-named pipe extends, substantially as and for the purposes specified.

2. A device of the class named, consisting of an acid-tank, a water-tank, an upper series of tanks connected with the acid-tank and the water-tank and to each other, a lower series of tanks adapted to receive the substance to be treated, connected to the upper series of tanks and to the water-tank and to each other, a retort, means for heating the retort, a pipe passing from the retort through the lower series of tanks, a condenser into which the last-named pipe extends, and a gasometer connected with the pipe issuing from the retort and with the upper series of tanks, substantially as and for the purposes specified.

3. A device of the class named, consisting of a lower series of tanks adapted to receive a substance to be evaporated, pipes connecting the lower series of tanks together, a retort, means for heating the retort, a pipe passing from the retort through the lower series of tanks, an upper series of tanks, pipes connecting the upper series of tanks together, a pipe connecting the upper series of tanks to the lower series of tanks, a pipe connecting the upper series of tanks to the pipe passing from the retort, and a condenser into which the pipe passing from the retort extends, substantially as and for the purposes specified.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses.

CHARLES H. RIDER.

Witnesses:

ALFRED A. EICKS,  
M. G. IRION.