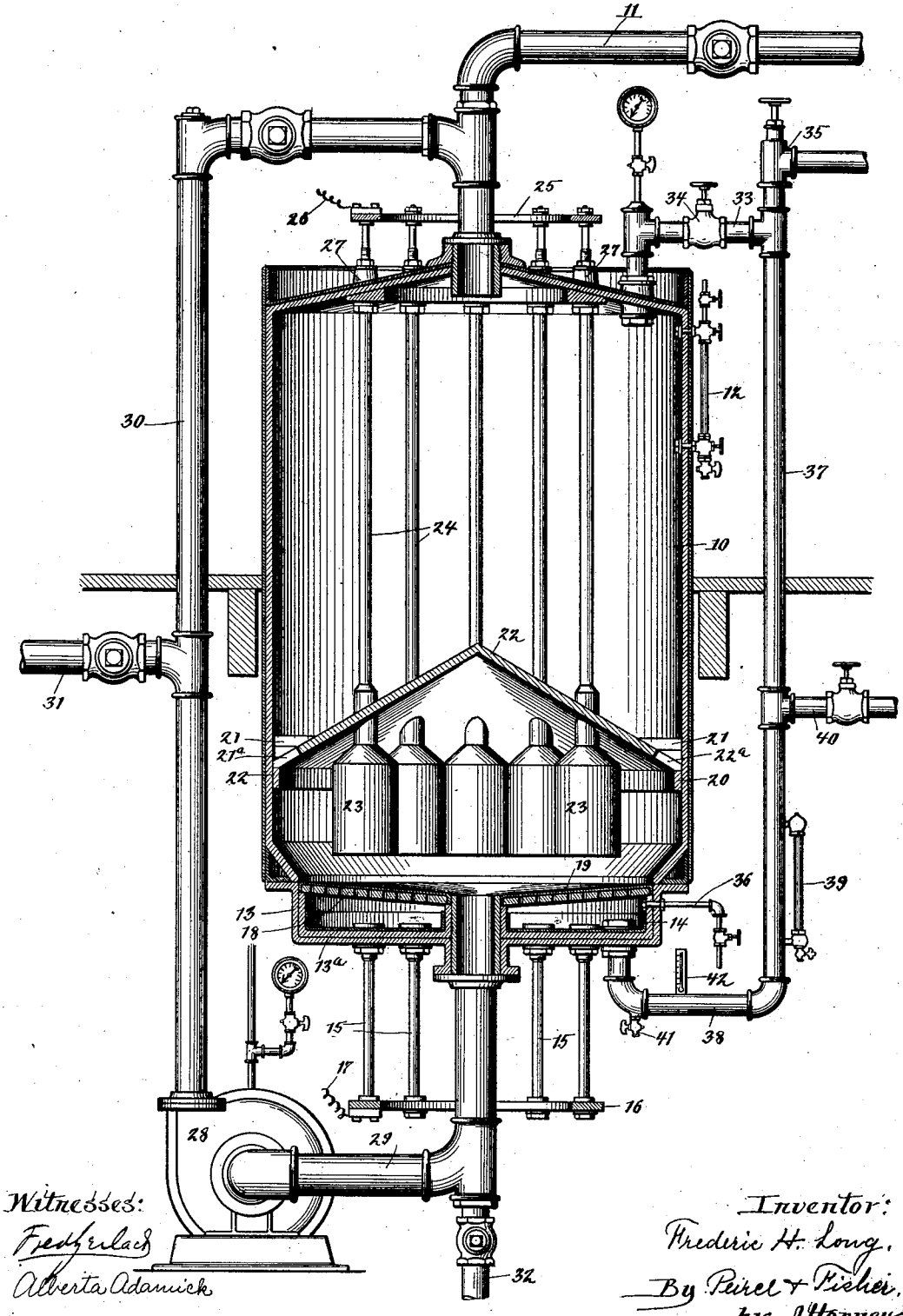
No. 699,964. Patented May 13, 1902.

F. H. LONG.

ELECTROLYTIC CONVERTER.

(Application filed Oct. 18, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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ELECTROLYTIC CONVERTER.

SPECIFICATION forming part of Letters Patent No. 699,964, dated May 13, 1902.

Application filed October 18, 1900. Serial No. 33,420. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC H. LONG, a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Electrolytic Converters, of which the following is declared to be a full, clear, and exact description.

In the operation of the converter or reducer set forth in my Letters Patent No. 650,646, dated May 29, 1900, and of which the present invention is an improvement, I have discovered that the gases which are evolved in large quantities collect beneath the diaphragm located between the cathode and anode terminals, and thereby increase the electric resistance and materially affect the efficiency of the apparatus. The present invention seeks to provide means to effect the release of the gases so accumulated beneath the diaphragm, while retaining the arrangement and advantages of the former construction.

The nature of the invention will appear in detail from the description following and be more fully pointed out by claims at its conclusion.

The drawing displays the preferred from of my improved converter in longitudinal vertical cross-section.

The details of construction and of operation of the converter or reducer are practically the same as set forth in my former patent and in which the wood-lined metal tank-body 10 is provided with a valved inlet-pipe 11, through which the pulverized ore, mixed with common salt in solution and quicklime, is admitted to the desired level, as shown by the gage-glass 12.

The cup-shaped bottom 13 is removably secured to the body of the tank by suitable bolts and is provided with a wooden lining 13^a, supporting the shallow copper pan 14, which constitutes the cathode element of the reducer. The pan is in metallic connection with a depending circular series of copper rods 15, extending through the bottom 13 and united at their outer ends to the copper ring 16, having the wire-terminal 17 connected therewith. Supported on the lining 13^a of the bottom is a horizontally-disposed dished diaphragm consisting of a perforated wooden grid 18, cotton-duck or canvas cover 19, and interposed layers of bibulous paper, which serves to exclude the solid, while the liquid portions of the charge may pass through, and the metal held therein in solution may be deposited at the cathode-pan.

Supported on a ring 20 and held in place by blocks 21 is a conical partition or spreader 22, having notches 22^a at intervals in its outer rim.

The anodes consist of hard carbon pole-heads 23, arranged in circular series beneath the partition 22, and are each united by a long copper rod 24, extending upward through the top of the converter to a copper ring 25, which is connected by the line-wire 26 with the source of the electricity. The rods 24 are insulated from the top by suitable sleeves 27.

The charge is maintained in circulation to thoroughly agitate the mass to aid the chemical action of the solvent, to keep the surface of the diaphragm or pad free from slime, and to direct the charge to flow along between the anodes and the diaphragm, so as to successively expose all parts of the batch to the disruptive influence of the electric current. This circulation is effected in my former construction by an internal pump; but I prefer to employ an external centrifugal pump, as 28, the inlet-port of which is connected by the elbow-pipe 29, projecting through the bottom of the reducer and extending above the diaphragm. The outlet-port of the pump is connected by the valved return-pipe 30, opening for convenience into the feed-pipe 11. By the pump the contents are constantly withdrawn from the bottom of the converter and returned anew through the top, from which it flows over the partition or spreader 22, through notches 22^a, and between the anodes 23 and the diaphragm, the surface of the latter being thus swept free of all slime. Valved exit-pipes 31 and 32 are provided by which the charge may be run off through the former by aid of the pump and through the latter by gravity. Vent-pipe 33, provided with shut-off cock 34 and valve 35, serves to relieve any excessive pressure of gases or vapors evolved during the decomposition of the charge. After a number of charges have been run through the converter the bottom 13 is removed and

the metallic deposits on the cathode-pan 14 cleaned up. Petcock 36 is provided to permit rich solution beneath the diaphragm to be drawn off in advance of the removal of the bottom 13.

The structure thus far set forth is much the same as that described more in detail in my former patent, No. 650,646. It has been found that in the operation of the converter or reducer as so constructed the electrical resistance gradually increased during the run without any apparent cause, thereby necessitating considerable increase in the voltage of the current. It was clear that this increased resistance was not due to imperfect circulation of the charge, or to accumulations on the surface of the diaphragm, or to any of the changes in the composition of the charge. I have, however, discovered that during the run of such a converter or reducer gases and vapors evolved by the chemical and calorific effects will accumulate and be entrapped beneath the diaphragm of cotton-duck and bibulous paper, so that the resistance to the passage of the current between the cathode and anode through the electrolyte is materially increased and the electrolytic action is interfered with. To remedy this defect, I connect to the space below the diaphragm a pipe 37, which extends upwardly above the level of the solution contained in that space to afford an exit for such gases and vapors as are developed and entrapped beneath the diaphragm. Preferably I connect this pipe 37 with the escape-pipe 33 between valves 34 and 35, by which the gases may be carried back into the converter or to a mixing-tank, (such as shown in my Patent No. 650,646,) so that the free chlorin contained in the gas will be utilized. I also preferably bend the lower end of the pipe in the form of a U-shaped portion 38, the end of which projects to some extent through the bottom of the reducer and affords a suitable location for gage-glass 39, petcock 41, and thermometer 42, by which the condition of the rich solution below the diaphraghm may be noted and the electric current regulated accordingly. This U-shaped portion will not act as a trap to prevent the escape of the air or gas, since the liquid below the diaphragm is in a state of violent ebullition and the gases are developed under sufficient pressure to overcome the hydrostatic column in this portion 38. The long upwardly-extending pipe acts as a separator to prevent any of the rich solution being entrained and carried off with the escaping gas; but the pipe 37 is provided with a valved pipe 40, leading to a suitable receptacle, and will serve to collect any small portion of valuable rich solution so forced up into the pipe.

By the discovery of the fact that gases were evolved and entrapped beneath the diaphragm and by the application of this simple contrivance I have decreased the electrical resistance and materially increased the efficiency and economy of the apparatus. It is obvious that any suitable upwardly-projecting vent which will allow ready exit for the gases, but would not permit the passage of any appreciable amount of liquid, would perform the function of my improved device. I do not, therefore, wish to be limited to the precise details of structure set forth.

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

1. In electrolytic converters, the combination with the closed reducer vessel having the anode and cathode terminals and the interposed diaphragm dividing the vessel into upper anode and lower cathode chambers, of a combined separator and vent-pipe connected to the cathode-chamber beneath the diaphragm extending upwardly above the level of said diaphragm and having a free outlet for the gases, substantially as described

2. In electrolytic converters, the combination with the closed reducer vessel having the anode and cathode terminals and an interposed, substantially horizontal diaphragm dividing the vessel into upper anode and lower cathode chambers, of a combined separator and vent-pipe connected to the cathode-chamber beneath the diaphragm and extending upwardly beyond the diaphragm and having separate outlets for the gases and liquids, substantially as described.

3. In electrolytic converters, the combination with the closed reducer vessel having the anode and cathode terminals and an interposed diaphragm dividing the vessel into upper anode and lower cathode chambers, of an external, combined separator and vent-pipe having a U-shaped lower end opening through the bottom of the reducer vessel into the cathode-chamber beneath the diaphragm, extending upwardly above the level of said diaphragm and having a free outlet for the gases, substantially as described.

4. In electrolytic converters, the combination with a reducer vessel having anode and cathode terminals and an interposed diaphragm dividing the vessel, of an external, upright, separator and vent-pipe opening into the space beneath the diaphragm, and having a connection with the top of the vessel substantially as described.

5. In electrolytic converters, the combination with a reducer vessel having anode and cathode terminals and an interposed diaphragm dividing the vessel, of an external, upright, separator and vent-pipe opening into the space beneath the diaphragm and having a branch intermediate its ends substantially as described.

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