(No Model.)

A. DERVAUX.

PROCESS OF PURIFYING WATER.

No. 495,313. Patented Apr. 11, 1893.

Fig. 1.

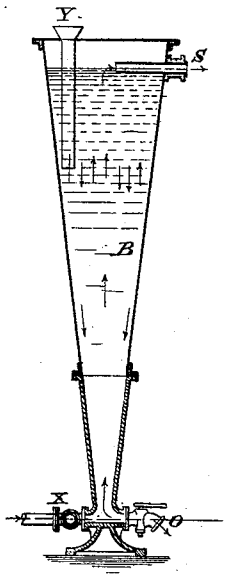


Fig. 2.

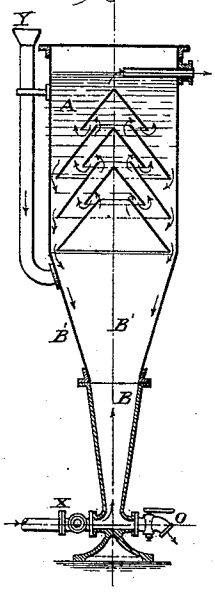


Fig. 3.

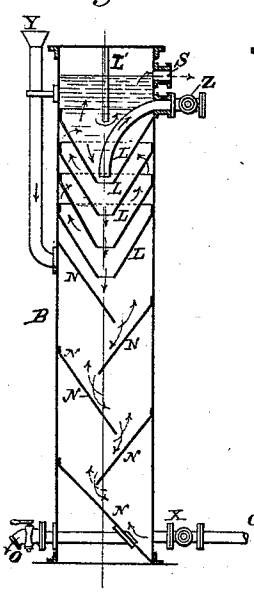


Fig. 4.

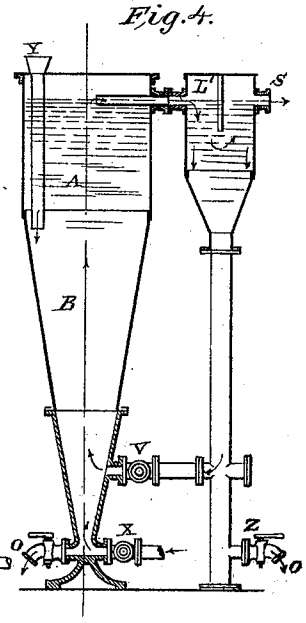


Fig. 5.

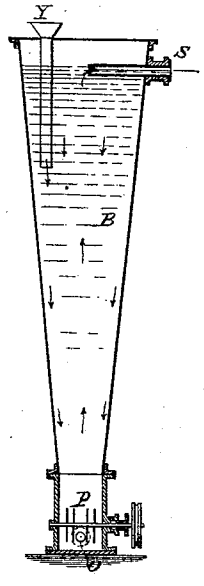


Fig. 6.

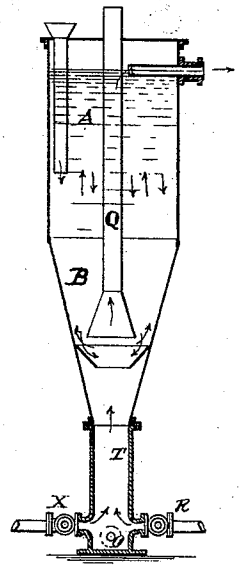
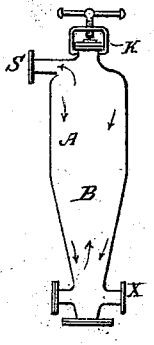


Fig. 7.



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UNITED STATES PATENT OFFICE.

ALFRED DERVAUX, OF BRUSSELS, BELGIUM.

PROCESS OF PURIFYING WATER.

SPECIFICATION forming part of Letters Patent No. 495,313, dated April 11, 1893.

Application filed August 2, 1888. Serial No. 281,715. (No model.) Patented in Belgium March 31, 1888, No. 81,258; in France April 3, 1888, No. 189,766; in England July 4, 1888, No. 9,756; in Italy July 9, 1888, No. 23,803; in Germany July 11, 1888, No. 48,268; in Austria-Hungary July 14, 1888, No. 37,573 and No. 59,703; in Spain July 23, 1888, No. 1,711, and April 29, 1891, No. 2,388, and in Switzerland April 4, 1890, No. 2,207.

To all whom it may concern:

Be it known that I, ALFRED DERVAUX, engineer, of Brussels, (No. 78 Boulevard Anspach,) in the Kingdom of Belgium, have invented an Improved Method of Purifying Water, (for which I have received Letters Patent in Belgium, No. 81,258, dated March 31, 1888, No. 81,519, dated April 23, 1888, (an addition,) and No. 81,739, dated May 8, 1888, (addition;) also in France, No. 189,766, dated April 3, 1888, April 21, 1888, May 4, 1888, June 2, 1888, June 21, 1888, and July 4, 1888, (additions;) in Great Britain, No. 9,756, dated July 4, 1888; in Germany, No. 48,268, dated July 11, 1888, and No. 61,029, dated June 23, 1890, (addition;) in Austria-Hungary, No. 37,573 and No. 59,703, dated July 14, 1888; in Spain, No. 1,711, dated July 23, 1888, and No. 2,388, dated April 29, 1891; in Italy, No. 23,803, dated July 9, 1888, and No. 29,701, dated May 13, 1891, (addition,) and in Switzerland, No. 2,207, dated April 4, 1890, and April 8, 1892;) and I hereby declare the following to be a full and exact description of the said method, reference being had to the accompanying drawings, in which I illustrate apparatus for carrying out the same.

Figure 1 is a vertical sectional view of the preferred form of said apparatus. Figs. 2, 3 and 4 are views of modifications hereinafter referred to. Fig. 5 is a sectional view of the apparatus shown in Fig. 1 provided with a mixing wheel in the lower end thereof. Figs. 6 and 7 are views hereinafter referred to.

The reagent I prefer to employ for carrying out my method is lime, which is dissolved in and mixed with the water to be purified, in the manner hereinafter described.

Referring to Fig. 1, the saturating reservoir B employed for the preparation of the milk of lime is an inverted hollow cone or pyramid. The lime is delivered into it through the funnel Y and the water to be saturated with the lime is received by the pipe X. This water passes upward and meets the lime, thus forming milk of lime, then, as it rises into the upper part of the apparatus, which may be furnished with interrupting, or baffle, partitions, or it may be simply enlarged. The water as it moves upward and clarifies, allowing the lime that it holds in suspension to fall to the contracted bottom of the reservoir, while the purified water passes off, in the state of lime water, by the exit pipe S. (The arrows pointing upward indicate, in all the figures, the ascension of the saturated water, and the descending arrows, the fall of the lime in suspension, not dissolved.) Then, by special application of suitable partitions for breaking up or interrupting the current, or simply by the greater diameter of the saturator B in its upper part, the upper stratum clears up and flows off while the lime in suspension, by reason of there being no flat bottom to the vessel on which it can deposit, is constantly returned to the path of the water which enters at the bottom of the conical vessel B. I thus effect, in the same apparatus, simultaneously, a decantation and a mixing, and attain a continuous production of milk of lime. It will be understood, that, as the turbid liquid rises or bubbles up in the receptacle B, the solid matter mixes with or remains mixed with the alkaline solvent; but, above a certain indefinite point or line, located usually at about one third the height of the receptacle, the velocity of the ascending current and likewise the agitation due thereto are diminished, partly in consequence of the enlargement of the cross sectional area of the receptacle B, so that the intermingling of the solid matter with the solvent becomes less, and hence at this point decantation may begin.

In place of being conical throughout, the lower portion only of the saturator may be made conical, and the upper portion made in the form of a cylinder A, as shown in Fig. 2. Partitions L arranged transversely, and inclined as to their shorter diameter at an angle of forty-five degrees, serve to break up the ascending current and thus cause the desired decantation. I may employ a cylindrical or prismatic decanter A, with or without suitable partitions L, surmounting the cone B, in which the saturation is effected.

It will be remarked, again relating to Fig. 2, that I superpose on the lower cone B, a truncated cone B′ of greater angle; this does not, however, depart from the principle above

explained. I also employ (to illustrate the same principle) a conical, pyramidal, or simply cylindrical or prismatic reservoir (Fig. 3) of which the lower part is furnished with blades or plates, N, inclined toward the base, the upper part being free or furnished with baffle or decanting partitions L L L L′. In this last type of apparatus, I close the bottom of the upper partition L^3, which then constitutes a receiver for the deposition of the carbonate of lime formed in the apparatus. This upper part (the decanter L′ of the saturator) I prefer to place at one side, as shown in Fig. 4, but always at the same height. It may have a conical bottom, and this bottom can be prolonged downward to the bottom of the saturator, with which it is put in communication, which communication may be interrupted by means of the cock V, when it is desired to collect the deposits in the decanter L′, in order to expel them by the cock Z; or, as shown in Figs. 5 and 6, in order to form the lower bottom of the separator, I may provide a cylinder T, which may be surmounted by a truncated cone, or a simple pyramid B, as in Fig. 5, or connected to an upper cylinder or prism A, as in Fig. 6.

In the bottom of the conical or cylindrical saturator, (in the latter case furnished with partitions as described) I place a suitable mixer P, Fig. 5, to be driven by means of a cord or belt, for example; or I may employ, see Fig. 6, a jet of steam, air, or gas, which enters by a cock, R, to perform the same office, that is to say, to intimately mix the water with the lime in the contracted bottom of the apparatus, where it constantly falls, because there is no flat bottom on which it can deposit, the lime in suspension separating itself from the water in the upper part, which is enlarged or furnished with suitable decanting partitions as before described. In this case, a chimney Q furnishes an escape for the steam, air, or gas.

I employ for preparing solutions of soda, chloride of barium, or other readily soluble reagents, a saturating apparatus based on the same principle, but of reduced dimensions. It consists of a conical or pyramidal receiver A, Fig. 7, in which the reagent to be dissolved is thrown. If the solution is to be raised by pressure of water into an upper reservoir, for example, this receiver is closed at its upper part by a suitable cover K. The water arrives at the bottom of the apparatus by the pipe X, and leaves the apparatus by the upper pipe S, after having passed the soda, dissolving it. The reservoir to receive the solution is gaged, and the reagent is weighed to assure the desired strength of solution.

I claim—

1. The herein described method of charging water with lime consisting in forming an upwardly flowing column of water, delivering the lime to the water at a point below the outlet of the latter, thus permitting it to gravitate against the upwardly flowing column and decanting the charged liquid at a point above and sufficiently removed from the point of delivery of the lime to permit all of the undissolved lime to gravitate toward the inflowing water and prevent the same from flowing out with the outflowing charged liquid, substantially as described whereby only the lime can escape as set forth.

2. The herein described method of charging water with lime to be dissolved consisting in forming an upwardly flowing column of water and permitting such column to expand toward the top, delivering the lime to the column at a point intermediate the top and bottom of the column, causing the undissolved lime to gravitate against the upward flow of the current and decanting the charged liquid at a point above and sufficiently removed from the point of delivery of the current to permit gravitation of the excess toward the inflowing water and prevent the same from flowing out with the outflowing charged liquid, substantially as described whereby only the dissolved lime can escape, as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 17th day of July, 1888.

ALFRED DERVAUX.

Witnesses:
EMILE NUYS,
LOUIS FOURDIN.