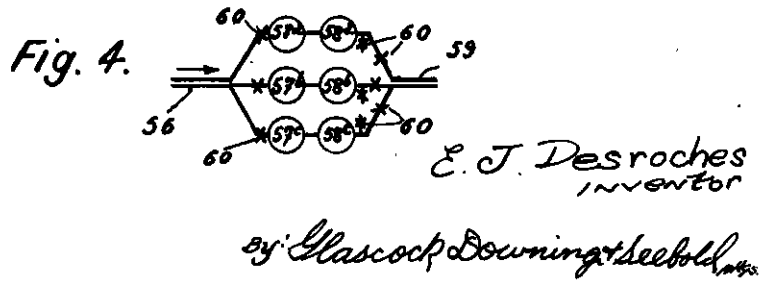
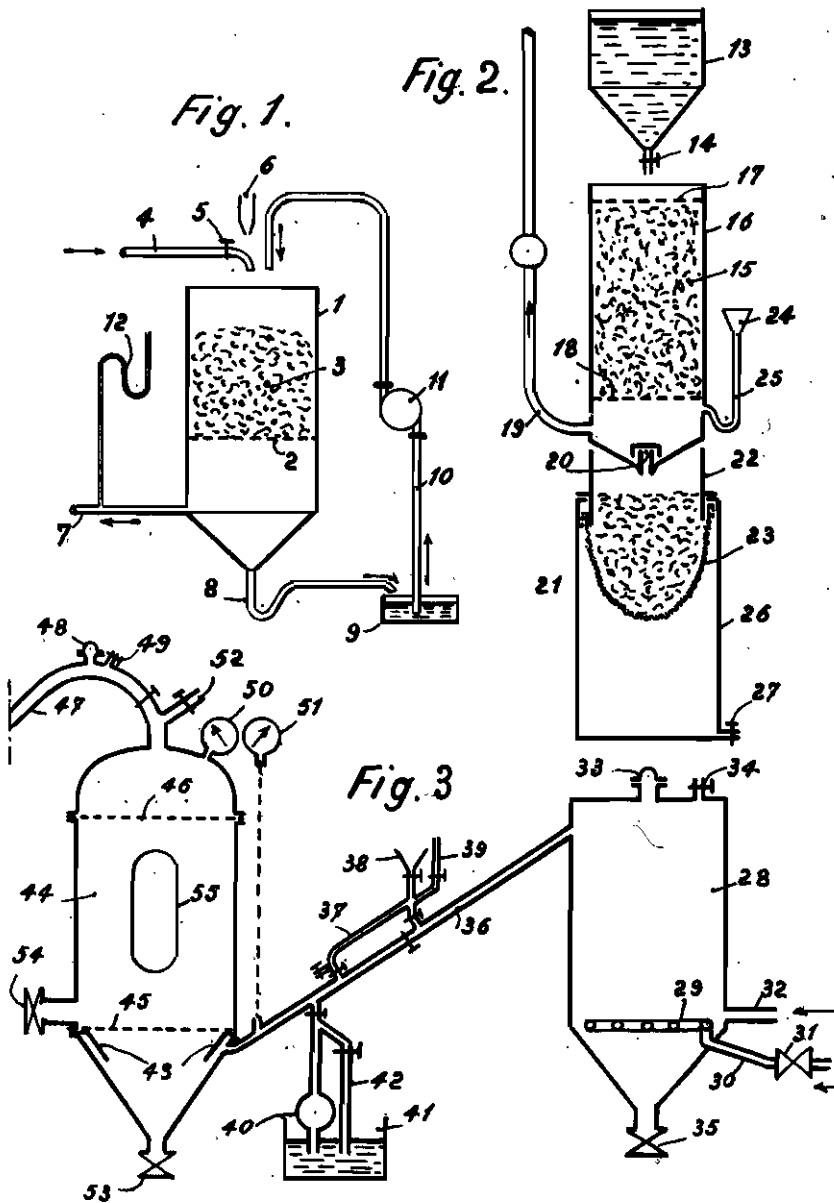


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PURIFICATION OF WATER
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PURIFICATION OF WATER

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vested in the Alien Property Custodian

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This invention, due to Mr. Eugène Desroches, relates to the purification of water.

The object of the invention is to provide a purification process which consists in causing water to be purified to pass over cellulose, in loose condition or otherwise, or over bodies the main ingredient of which is cellulose, or similar materials, such as asbestos, the passage of water through the mass of cellulose or the like being accompanied by a more or less intense aeration, the direction of flow of the air being the same as that of the water.

As cellulose or body the main ingredient of which is cellulose, use is made of rags, paper, cellulose wool, etc.

It has been found that this purifying process, particularly simple, is of great efficiency for the treatment as well of water adapted to be used for drinking purposes as of so-called waste water.

In particular, it has been recognized that this process allows, by its previous application, to bring waters considered up to now as very difficult to treat, to such a condition that their subsequent treatment or filtration by the various known processes (in particular by the process according to the United States Patent of January 22nd 1937, in the name of Mr. Desroches, for: "Method of filtering and treating water and systems and apparatus for the application of this method") is thereby greatly facilitated and accelerated.

It has also been recognized that the purifying process according to the invention allows in itself, in many cases, to convert a natural water unsuitable for consumption into a water satisfying all the conditions of hygiene.

It will be understood that, for the purification of water adapted to be used for drinking purposes, white rags or white paper, or even cellulose wool are preferably chosen; in case these substances are employed, in order to avoid coloration of the purified water.

In case of purification of waste water, the choice of the materials the main ingredient of which is cellulose may not be so strict; thus, use may be made of town refuse, or garbage, but containing cellulose in high proportions.

It may also be economical to associate these various purifying agents, by constituting the purifying layer by superpositioning of elementary layers, for instance successively, starting from the bottom, of cellulose wool, washed rags, unwashed rags, garbage.

The sole use of garbage results in a water preserving a relatively noticeable coloration, so that

garbage is only employed for the purification of waste water.

For certain waters difficult to treat, it is advantageous to introduce, before their passage over cellulose, ingredients facilitating subsequent treatment. As ingredients may be cited, by way of example, natural carbonate of lime, alumina hydrate, ferric hydrate, alumina sulphate, perchloride of iron, etc.

On the other hand, it is advantageous, in some cases to subject the cellulose to a preliminary treatment which is most often a surface treatment carried out by application of a process similar to dyeing: the cellulose is thus impregnated with various bodies, such as alumina, carbonate of lime, permanganate of potash, ferric hydrate, alumina silicate, etc.

For this operation, one may start from the colloids themselves, or the reaction can be carried out on the cellulose; for instance, the cellulose can be impregnated with alumina sulphate and subsequently washed with a strong base or a soluble silicate, or the cellulose can be impregnated with acidulated water and subsequently washed with a soluble aluminate or a soluble silicate, or again the cellulose can be impregnated with a strong base and washed with an iron salt.

The cellulose thus treated can intervene, for purification purposes, alternately with pure cellulose, by placing for instance, a layer of pure cellulose, a layer of "dyed" cellulose, etc.

Other materials have purifying properties similar to those of cellulose and of asbestos. These materials, which are very numerous, must have the following properties:

Be insoluble in water,
Be in a very divided condition so as to present a very large surface of contact,

Have a great adsorbing power, or at least an adhesive power,

Be in such a condition that, when in layers, they are sufficiently pervious to water and to air under a small pressure.

As mineral materials can be cited, by way of nonlimitative examples: mineral wools, for instance slag wool of blast furnaces, sands, certain coals and pulverized clinker, etc., as organic materials, the natural or artificial ternary products similar to cellulose (cellulose wool, alga moss, etc.).

The purifying layer can include not only various layers of different kinds of cellulose, but also layers of different mineral bodies or even of mineral bodies and of organic bodies, this for the purpose of utilizing the particular adsorbing

properties which may be different relatively to certain impurities of the waters to be treated.

The invention also relates to an apparatus for carrying into practice the process above defined. This apparatus, under its various forms of construction answering to the various forms of carrying the process into practice, is characterised by the presence of a mass of cellulose or of other bodies as indicated above on which is supplied the water to be purified and from which flows the purified water, and by means allowing aeration of this mass humidified by water, in course of the purifying operation.

This apparatus can be preceded by a distributor of ingredients; however, for the sake of economy, these ingredients can simply be arranged, in a divided form, at the upper part of the mass of cellulose or other body indicated above, or they can be interposed in this mass.

In some cases, the starting of an apparatus causes an operative phase to intervene during which initiation of the fermentations takes place; the water which passes through the apparatus during this phase can then be returned to the untreated water circuit for a further passage which completes its purification.

After a certain time of operation, the apparatus must be regenerated; most often, this regeneration is simply effected by cutting off the supply of untreated water and by maintaining the aeration.

When this regeneration is no longer possible, the cellulose or other similar bodies removed from the apparatus and washed in order to constitute a new active layer, or it is replaced by active cellulose or other similar active body. If the water is highly laden with Az, the cellulose or the like is left in the apparatus; the supply of untreated water is definitely cut off and the aeration is controlled so as to obtain humidification of the exhausted cellulose or the like and the drying of the mould obtained.

When the adsorbing materials are arranged according to a relatively great thickness, the regeneration of the apparatus can be effected, after having cut off the water supply and maintained the air suction during the time necessary for obtaining a first drying, either, if only an abnormal increase of the loss of pressure of the air by loosening (by hand or mechanically) of the upper layer, or, on the contrary, if the quality of the water has become insufficient or if the operation above mentioned has proved to be inoperative, by simply removing this layer which is the most heavily laden, and by allowing the subjacent layers to subsist.

If the adsorbing materials are of a mineral nature, they can be regenerated by heating (without contact with air if the material employed is combustible or if ignition of the gases produced is feared) after they have been removed from the apparatus.

If said adsorbing materials are of an organic nature, they are placed in a fermentation cell similar to those used for the fermentation of garbage or household refuse.

Three forms of construction of an apparatus for carrying into practice the process according to the invention are described hereinafter, by way of examples, with reference to the accompanying drawing, in which:

Fig. 1 diagrammatically illustrates a preliminary apparatus according to the invention.

Fig. 2 diagrammatically shows the combination of a preliminary apparatus and of a filter.

Fig. 3 illustrates an overhead preliminary apparatus.

Fig. 4 illustrates a battery of such preliminary apparatus.

The preliminary apparatus (Fig. 1) comprises a chamber 1 open at its upper part, and limited at its lower part by a grate 2. In the chamber 1 are piled up, for forming a mass 3, bodies made of cellulose or the main ingredient of which is cellulose, or chosen among those indicated above.

The untreated water is supplied by a pipe line 4 provided with a control cock 5. In important installations a distributor ensures satisfactory distribution of this untreated water. Eventually, a distributor 6 allows the distribution of the ingredients in the water of pipe line 4.

The interior of chamber 1 is connected to a suction device (not shown) the action of which is adjustable, through a pipe 7 opening below the grate 2.

The purified water is collected in a pipe 8 connected to a discharge pipe line 9.

Eventually, a return circuit 10 can be provided between the pipe line 9 and the upper part of chamber 1. In this circuit is interposed a pump 11 sucking water from pipe line 9 and delivering it above the mass 3. This pump is used upon starting of the apparatus, during the phase of initiation of the fermentations.

A pressure gauge 12 and an apparatus for measuring the output allow of controlling at every instant the intensity of the suction.

Fig. 2 diagrammatically illustrates the combination of a preliminary apparatus and of a filter.

The untreated water is contained in a tank 13 from which it flows through a cock 14. In more important plants, the untreated water is directly admitted through a supply pipe line.

The tank 13 is located above the preliminary apparatus; the cellulose 15, or the like, is held in chamber 16 between two grates 17 and 18. The suction of the air is effected through a pipe 19; in small plants, this suction is simply effected by the draught produced by a lighted lamp; in other plants, the suction is obtained by means of a fan.

The base of chamber 16 is provided with a siphon 20 through which it communicates with a filter 21. The latter is, for instance, of the type described in the United States Patent application January 22nd 1937, in the name of Mr. Desroches. In the form of construction illustrated, it is constituted by a support 22, in the shape of a ring, to which is attached a cloth 23, of a colloidal nature (wool, silk, cotton, asbestos, etc.).

The bag constituted by the cloth 23 is filled with cellulose or with substances the main ingredient of which is cellulose or the like. The colloid or colloids for the formation of the membrane on the cloth 23 are poured through a funnel 24 connected to the lower part of chamber 16 through a pipe 25.

The filtered water falls in a tank 26 from which it can be extracted through a cock 27. In small filters, this tank is conveniently constituted by a vessel made of porous material for obtaining fresh filtered water.

In large plants, the tank 26 is dispensed with, the filtered water directly flowing in a discharge pipe line.

For cleaning the cloth 23, the latter is removed from the supporting ring 22.

Fig. 3 shows a form of construction of an overhead preliminary apparatus. The chamber 28

acts as an aeration column. It contains, at its lower part, a perforated ring or a perforated spiral 29 or better sleeves made of cloth through which compressed air is distributed. The latter comes from a pipe line 30 in which are interposed apparatus 31 for measuring the head and the air output.

The untreated water enters the base of the column through the pipe 32. This water is aerated during its passage through said column. The air in excess escapes through an automatic vent 33; an independent cock 34 is also provided for that purpose.

The washing of the column is effected through an orifice 35 provided at the lower part of the latter.

The column or aerator is connected to the preliminary apparatus proper through a pipe line 36 from which extend:

(a) A by-pass pipe 37 for the introduction of solid ingredients through the funnel 38, a vent 39 being provided on this by-pass pipe;

(b) A pump 40 sucking liquid ingredients in a vat 41 and provided with a return pipe 42 for controlling the outflow.

The pipe line 36 leads to the base of the preliminary apparatus in front of a flange 43 acting as a deflector. The preliminary apparatus is constituted by a chamber 44 at the base of which is arranged a large mesh support 45, for the cellulose or substance the main ingredient of which is cellulose or the like.

The water to be purified passes upwardly through this chamber 44. At the upper part of the preliminary apparatus, this water encounters a cloth 46, of a colloidal nature, on which a filtering membrane has been formed by means of gels poured in the water to be purified by application of the process forming the subject-matter of the United States Patent application filed on January 22nd, 1937, in the name of Mr. Desroches. The purified water issues through a pipe line 47 on which is provided an automatic vent 48 with an independent cock 49. Eventually a supplementary introduction of compressed air can be provided at the base of the preliminary apparatus.

Two pressure gauges are provided at the inlet and at the outlet, respectively, of the preliminary apparatus.

The washing of the latter is effected by means of a connecting branch 52 and a lower orifice 53; the discharge of the cellulose is effected through a connecting branch 54 and a man hole 55.

Fig. 4 shows a battery constituted by three devices such as that which has just been described. The untreated water is supplied by a pipe line 56 and is distributed in the three groups, arranged in parallel, of aerators 57 and preliminary apparatus 58. The purified water issues through a pipe line 59. Cocks 60 allow to put in service the desired number of groups.

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