

(No Model.)

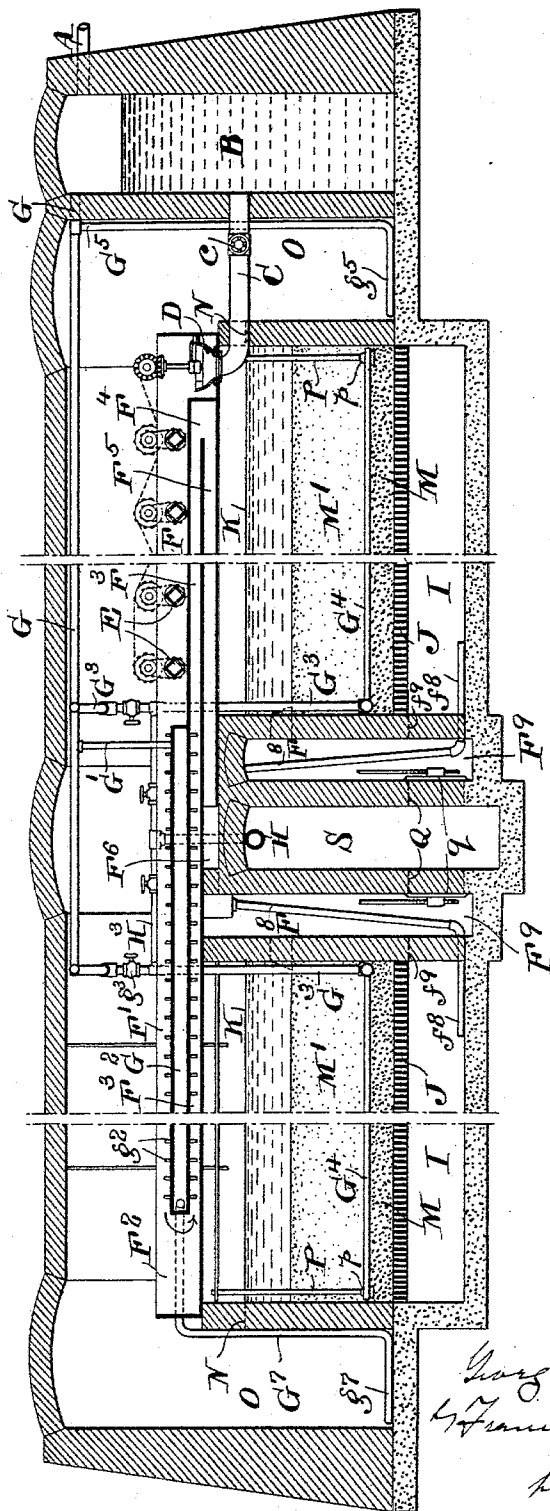
2 Sheets—Sheet 1.

G. H. SELLERS.
APPARATUS FOR PURIFYING WATER.

No. 564,942.

Patented July 28, 1896.

FIG. 1.



Witnesses.

Henry Dwyer
W. J. Pack

Inventor.

George H. Sellers
Francis T. Chambers
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FIG. 3.

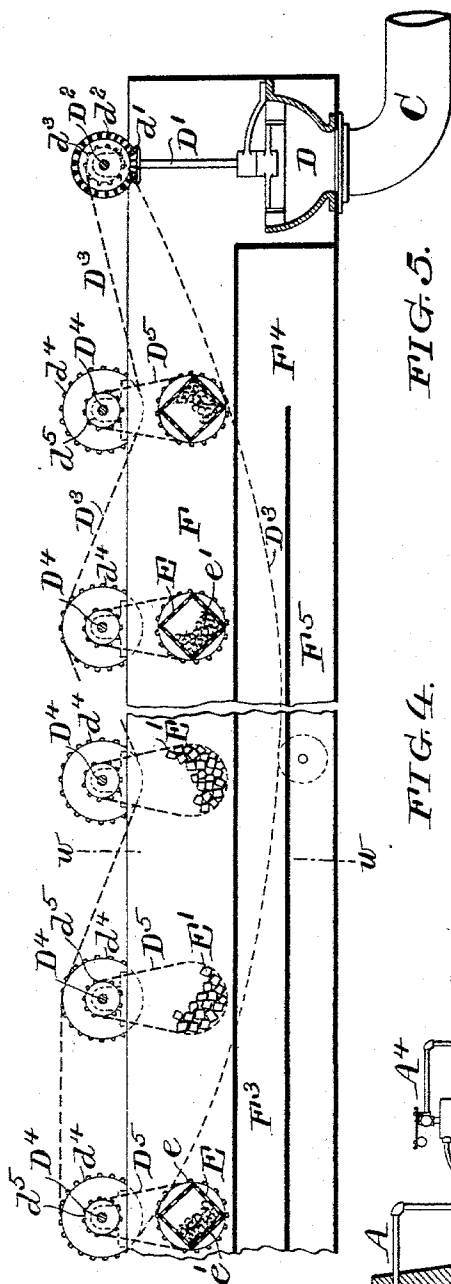


FIG. 5.

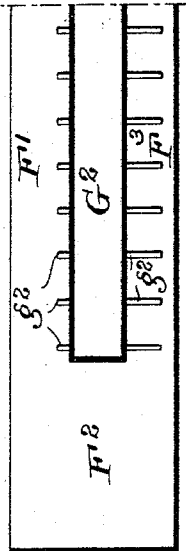


FIG. 4.

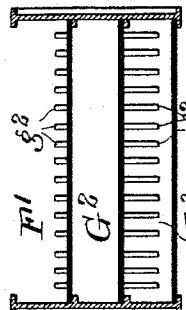


FIG. 6.

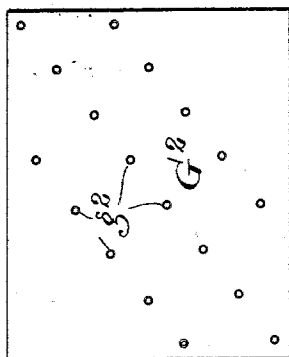
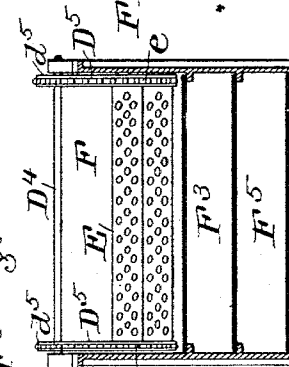


FIG. 7.



Witnesses.

Henry D. Smith
W. J. Park

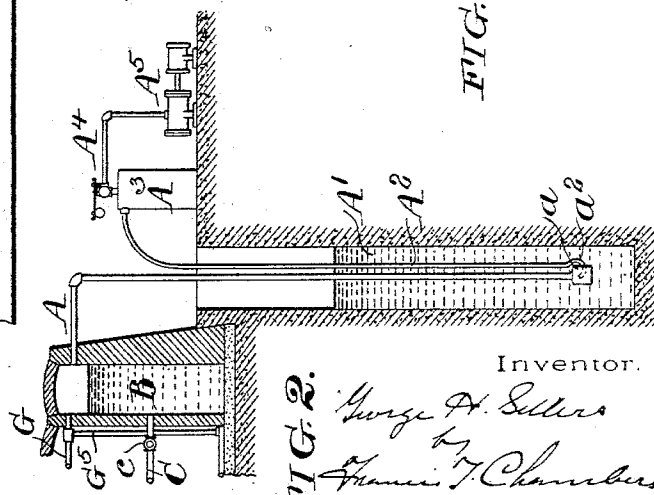


FIG. 2.

Inventor.

George H. Sellers
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UNITED STATES PATENT OFFICE.

GEORGE H. SELLERS, OF WILMINGTON, DELAWARE.

APPARATUS FOR PURIFYING WATER.

SPECIFICATION forming part of Letters Patent No. 564,942, dated July 28, 1896.

Application filed September 19, 1895. Serial No. 562,972. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. SELLERS, a citizen of the United States, residing at Wilmington, county of New Castle, State of Delaware, have invented a certain new and useful Improvement in Apparatus for Purifying Water, of which the following specification is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the purification of water, and particularly to the coagulation and oxidation of the impurities, aided by a thorough aerification of the water, which also has the effect of eliminating gaseous impurities.

The apparatus and devices which I have invented for accomplishing the above results are intended to be used in connection with settling-tanks or filters, preferably both, for separating the coagulated impurities from the water, as well as eliminating their separable solids, and the construction of the filter and its arrangement with reference to settling-tanks, which I have indicated in the drawings forming part of this specification, forms the subject-matter of another application for Letters Patent, filed September 19, 1895, Serial No. 562,973.

My present invention is to a certain extent in the nature of an improvement upon my former original application, filed May 29, 1893, Serial No. 475,843, and upon the divisional application filed by me September 16, 1895, Serial No. 562,630.

The nature of my improvements will be best understood as described in connection with the drawings, in which they are illustrated, and in which—

Figure 1 is a longitudinal section through a filter provided with my improved appliances for impregnating the water with a coagulant and for its thorough aerification. Fig. 2 is an elevation, partly in section, illustrating the means which I prefer to use for forcing the water into the reservoir from which I draw it into the conduits where it is subjected to the action of the coagulant and also to the action of air. Fig. 3 is an enlarged view of the devices which I preferably use for impregnating the water with a salt of iron to act as a coagulant. Fig. 4 is a cross-section

through the part of the conduit in which the aerification of the water takes place. Fig. 5 is an enlarged view of the end of this section of the conduit. Fig. 6 is a plan view of the bottom of the upper portion of the conduit, and Fig. 7 is a front elevation of one of my iron-containing boxes and the mechanism for actuating them.

A is a pipe through which water is forced into the reservoir B. Preferably I lift the water from a well or tank (indicated at A', Fig. 2) by means of the action of compressed air, A² indicating a compressed-air pipe, the end of which a² enters an enlargement a at the bottom of the pipe A. The pipe A², as shown, is connected with an air-reservoir A³, which in turn is connected with an air-pump A⁵ by a pipe A⁴. This is a familiar apparatus, known as an "air-lift pump," and has the effect of forcing both water and compressed air into the reservoir B.

C is a pipe leading from below the water-level of the reservoir B to a water-conduit F, and, as shown, a turbine wheel D is placed in the mouth of the pipe C, so as to be rotated by the water flowing from the reservoir into the conduit F, a shaft D' communicating motion from the turbine D to a miter-wheel d', which in turn is in gear with a miter-wheel d², secured to the transverse shaft D², to which is also secured a sprocket-wheel d³, Fig. 3.

As shown, the conduit F extends along the top of the filter-bed, forming a comparatively deep channel for the first part of its length, then rising to the top of an air chamber or conduit G² the water-conduit is continued, as indicated at F', passing downward at the end of the air-chamber G², as indicated at F², then beneath the chamber G², as indicated at F³, and beneath the portion F, turning down again at F⁴ and passing backward, as indicated at F⁵, until it reaches a distributing-chamber F⁶. From the chamber F⁶ the water passes down through pipes F⁸, which open into the distributing-chambers at their tops, issuing from said pipes at f⁸ into the bottom of the settling and supply chambers I, with which are connected through passages (indicated at f⁹) with the vertical chambers F⁹. These vertical chambers F⁹ may serve as the conduit between the distributing-chamber F⁶ and chamber I, taking the place of pipe F⁸;

but I prefer to use these pipes, so as to convey the water to chamber I with as little disturbance as possible, and to use chambers F^9 , which are in free communication with chambers I, simply as "stand-pipes," so to speak, to give a more regular pressure to the water in chamber I than would be the case if the head relied upon was only that of water in pipe F^8 . From the chambers I the water passes upward through supporting-gratings J into the filtering-chambers K K, of which there may be any desired number, and in which, supported on the gratings J, is the filter-bed, (indicated at M M'.) From the chambers K the water passes through the openings indicated at N N into the pure-water reservoirs O O, from which it can be drawn off as desired.

S, Fig. 1, indicates a conduit for waste water used for washing the filter. It is connected with each chamber I by openings, as indicated at Q, said openings being normally closed by valves or gates, as indicated at q. These gates are opened when it is desired to wash any section of the bed, and the water from the corresponding chamber I then runs out through chamber S, while water from the top of the bed passes down through the bed into chamber I.

The portion F of the water-conduit is that in which I prefer to impregnate the water with the coagulant relied upon to throw down coagulable impurities or such impurities as are carried down together with the coagulant formed. For this purpose I prefer to use iron, although other coagulants may be used, and in using iron I take measures to suspend the mass of iron scrap or iron bars in the conduit F so that it will be submerged by the water passing through the conduit, and to keep it in motion, as is found desirable, if not essential, in using iron as a coagulant, and I will here state that I have discovered that greatly-improved results can be obtained in using iron in this way by mixing with the iron pieces of some metal, such as copper, with which the iron forms a galvanic couple, the galvanic action which takes place insuring a much larger separation of the iron-salt relied upon as a coagulant, but this discovery forms the basis of another application for Letters Patent filed by me September 6, 1895, Serial No. 561,649.

Referring now to the mechanism shown, D^4 D^4 , &c., are a series of shafts running transversely to the conduit F and each having secured to it a sprocket-wheel d^4 , over which passes a sprocket-chain D^3 , driven by the sprocket d^3 on the shaft D^2 , said shaft thus giving motion to the whole series of shafts D^4 . On each shaft D^4 is supported two or more endless chains, as indicated at D^5 . Preferably these chains are sprocket-chains and are kept in revolution by passing over sprocket-wheels d^5 on the shafts D^4 , but any means for keeping the chains D^5 in revolution may be resorted to. In the lower loops of the chains

D^5 , and so as to be supported and rotated by said chains, I secure the submerged masses or bar-iron or iron scrap to which I have already referred, and when iron bars are used I cut them off practically as long as the width of the conduit in which they are suspended and simply hang a bundle of the bars in the loops of the chains, as indicated at E', Fig. 1. Where, however, the iron is in small pieces, as indicated at e' , I place it in an angularly-formed perforated box, such as is indicated at E, and to the ends of each box are secured sprocket-wheels e , around which the chains D^5 pass. The rotation of the perforated box insures a thorough mixing up and rubbing together of the particles of metal, while the water has free access to the scrap through the perforations of the boxes.

From a source of air supply, preferably in the construction shown the upper part of the chamber B, I lead an air-conduit G, which connects with the air box or conduit G^2 by means of a pipe G' . The box or conduit G' which forms the bottom of the portion F' of the air-conduit and the top of the portion F^3 of said water-conduit, is provided with a multiple series of outlet openings or pipes, as indicated at g^2 , and by means of which air is injected into the bottoms of the portions F' and F^3 of the water-conduit. Preferably I also lead branches G^5 G^7 , Fig. 1, from the pipe G to the bottom of the pure-water reservoirs O, where such pipes terminate in perforated arms, as indicated at g^5 g^7 , so that air is forced into the purified water in these reservoirs.

As shown, a connection G^3 , provided with a valve g^3 , leads from the pipe G to pipes G^4 , which run transversely through the filter-bed at about the zone of deposit and are supplied with perforations by which the air is permitted to escape into the filter-bed when the valve g^3 is open. I may state here also that in practice I connect the pipes G^3 with a pressure water-main H, Fig. 1, by which water under pressure can also be forced into the pipes G^4 at will. The air and water forced into the pipes G^4 being for the purpose of aiding in the cleansing of the filter-bed and having no function to perform toward the direct purification of the water, need not be further referred to in this application. This also is true as to the pipes P, which open with a bell-mouth p in the body of the filter-bed and open again above the water-level of the filter. These pipes are simply for the purpose of permitting air to escape freely from the filter-bed and without passing entirely through it when water is drawn in for the purpose of being filtered.

Having now described my invention and the manner in which it is to be used, I claim as new and desire to secure by Letters Patent—

1. In combination with a conduit as F through which water to be purified passes, one or more rotatable shafts D^4 situated above

the conduit, chain-loops D^5 suspended from and rotated by said shafts and a mass of relatively-movable pieces of scrap-iron sustained by the lower part of each pair of loops and so as to be thrown into frictional contact with each other as the loops revolve.

2. In combination with a conduit as F through which water to be purified passes, a series of transverse shafts D^4 situated above the conduit and having sprocket-wheels d^4 secured thereto, a driving-chain D^3 engaging said sprockets, two or more chain-loops D^5 supported on and rotated by each shaft D^4 , a mass of relatively-movable pieces of iron scrap suspended upon and caused to rotate by said chains and so as to be thrown into frictional contact with each other by reason of such rotation and a motor arranged to drive chain D^3 .

3. In combination with a conduit as F through which water to be purified passes, a series of transverse shafts D^4 situated above the conduit and having sprocket-wheels d^4 secured thereto, a driving-chain D^3 engaging said sprockets, two or more chain-loops D^5 supported on and rotated by each shaft D^4 a mass of relatively-movable pieces of iron scrap suspended upon and caused to rotate by said chains so as to be thrown into frictional contact with each other and a motor driven by the flow of water arranged to drive chain D^3 .

4. The combination with a water and air reservoir B, of an open conduit as F for water to be purified, an air-conduit as G^2 having a multiple series of escape-pipes opening into the water-conduit, and pipes C and G leading from the water and air spaces of the reservoir to the said water and air conduits respectively.

5. The combination with a water and air reservoir B, of a conduit for water to be purified, means for impregnating the water with a coagulating salt or compound situated in the receiving end of the water-conduit, an air-conduit having a multiple series of escape-pipes opening into the water-conduit, on the delivery side of the portion containing the impregnating devices aforesaid, and pipes C and G leading from the water and air spaces of the reservoir to the water and air conduits respectively.

6. The combination of means for forcing compressed air into a moving body of water, with a conduit through which said body of water moves, a water and air reservoir as B arranged to receive the water and air, and into which said conduit opens, a water-conduit having means for impregnating the water with a coagulant situated in its receiving end, an air-conduit having a multiple series of openings into the water-conduit, and pipes C and G leading from the reservoir B to the water and air conduits respectively.

7. The combination of means for forcing compressed air into a moving body of water, with a closed conduit through which said body of water moves, an open water-conduit having means for impregnating the water with a coagulant situated in its receiving end, into which end the closed conduit aforesaid opens an air-conduit having a multiple series of openings into the open water-conduit and means for forcing air into the air-conduit.

8. The combination of means for forcing compressed air into a moving body of water, with a closed conduit through which said body of water moves, an open water-conduit having means for impregnating the water with a coagulant situated in its receiving end, into which end the closed conduit aforesaid opens an air-conduit having a multiple series of openings into the water-conduit, means for forcing air into the air-conduit, a filter arranged to receive the water as it leaves the water-conduit aforesaid, a receiving-chamber for the filtered water and means for forcing air into the bottom of said receiving-chamber to further aerify the filtered water.

9. The combination with an upward filtered having a settling-chamber situated beneath it, and a reservoir for filtered water, of a conduit leading to the settling-chamber situated above the filter, means for coagulating the impurities of the water situated in said conduit and means for injecting air into the water in the conduit and reservoir aforesaid.

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Witnesses:

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ROBERT W. LLOYD.