No. 638,421. Patented Dec. 5, 1899.

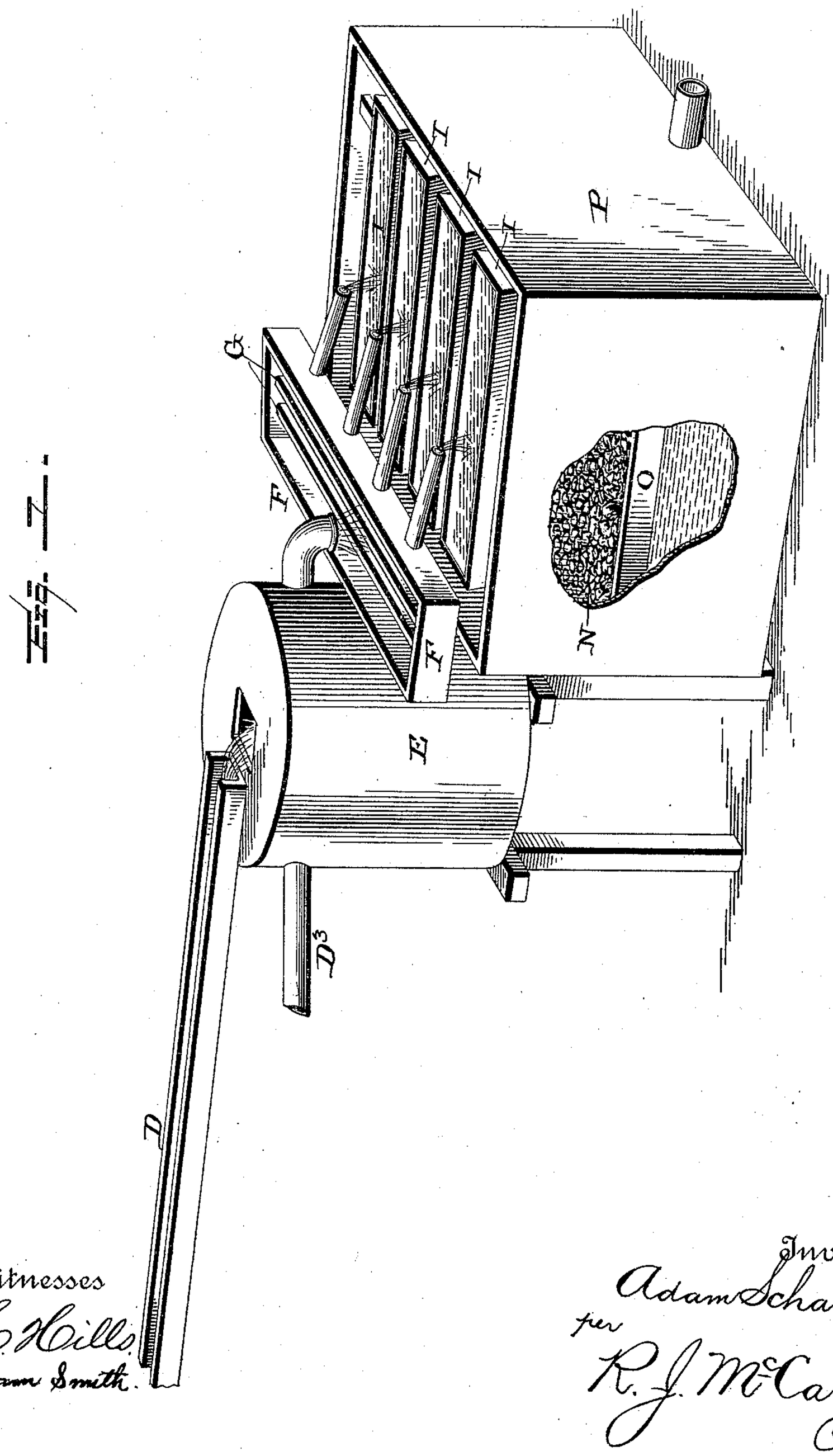
A. SCHANTZ.

APPARATUS FOR PURIFYING WATER.

(Application filed Sept. 13, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



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Rosamm Smith.

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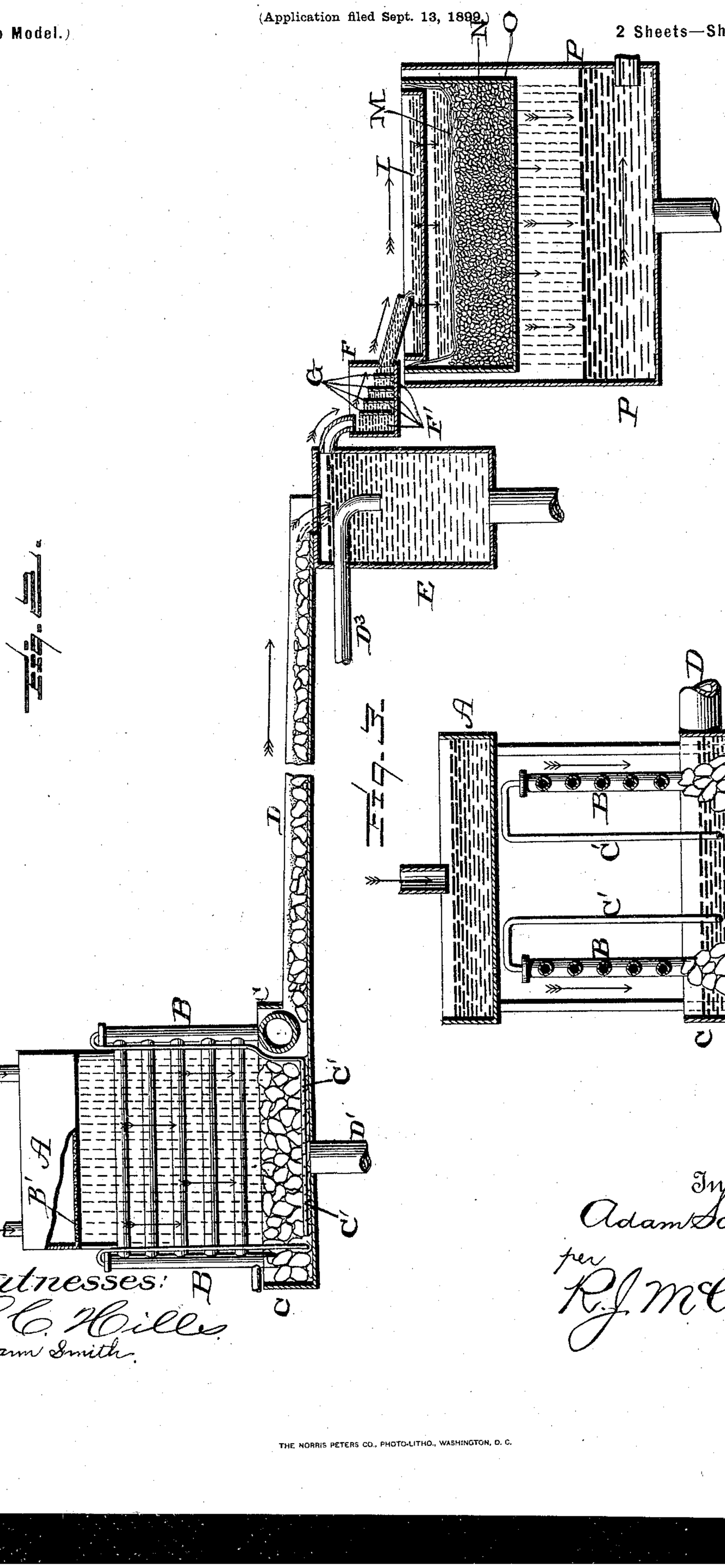

Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PURIFYING WATER.

SPECIFICATION forming part of Letters Patent No. 638,421, dated December 5, 1899.

Application filed September 13, 1899. Serial No. 730,304. (No model.)

To all whom it may concern:

Be it known that I, ADAM SCHANTZ, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Water Purification and Filtration; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to means for the purification and filtration of water for brewing, boilers, medicinal, and domestic uses.

In those parts of the country where the water is impregnated with lime, magnesia, and other mineral salts it is very difficult and expensive to rid the water of such organic substances and obtain it in a proper condition and quantity for use, it being necessary to subject said water to a boiling temperature for several hours before it is in condition for use, to say nothing of the damage done by such water to metal pipes and boilers by incrustation. The fuel consumed in this constant boiling of great volumes of water is very considerable, and the wear and tear on the metal are great.

My invention consists in subjecting the water as it falls from the reservoir in the form of a continuous sprinkle to heated pipes and then subjecting the water, which has been more or less heated by said pipes, to the action of a bed of heated boulders, upon which the water is made to fall and over which it is made to flow.

It also consists in first subjecting the water to the action of heated pipes as it falls from the reservoir upon a bed of heated boulders and then agitating the water after it has fallen upon the heated boulders by jets of steam for the purpose of keeping the water constantly moving.

It still further consists in the arrangement and combination of devices which will be more fully described hereinafter.

In the accompanying drawings, Figure 1 is a perspective of that portion of my apparatus in which the final separation of the lighter impurities of the water takes place. Fig. 2 is a vertical section of my apparatus complete. Fig. 3 is a detail view taken at right angles to Fig. 2.

A represents the initial receiving-tank for the water from the well or city pumping-station. This tank has its bottom perforated throughout with small holes B′, through which the water sprinkles in a continuous shower over and through several banks of pipes B, which are heated to a comparatively high degree by exhaust-steam. These pipes are mounted over a large open reservoir or tank C, which is water-tight and in which pyramidal-shaped piles of boulders or rocks are placed, one pile of rocks being placed under each set of pipes B. These pipes B are placed out in the open air, and the tank is entirely open at its top, so that the water in falling and after it is in the tank is subjected to the constant action of the atmosphere. In this tank C the heavier impurities are deposited, and the remaining lighter impurities, which are carried away by the water from this tank C, are deposited farther on, as will be more fully described hereinafter. If the pipes B and the tank C were inclosed so that the atmosphere could not have free play upon the water, the impurities would not be deposited near as rapidly or freely, and hence it is necessary that the pipes B should be exposed freely to the atmosphere and that the tank C should be open at its top. Over the boulders the water drops in a continuous spray after striking the heated tubes. This contact of the water in its separated and heated condition causes a ready precipitation of the mineral substances, and the initial step in the process of purifying the water is thus performed. It will be borne in mind that this step consists in heating the water in small particles or drops by means of heated pipes. Before they are again united they come in contact with the heated boulders in the open tank C. In this operation a large percentage of the heavy mineral substances, such as lime, is separated from the water. I use common boulders or rocks which are piled up in pyramidal form under each set of pipes, so that the water in falling from the pipes will drop directly upon the tops of these boulders, which being heated serve to attract the impurities in the water

and cause precipitation of the same upon the boulders. From these boulders the water flows out into the tank C, where it is subjected to escaping steam from the pipes C′, which are placed in the bottom of the tank and which escaping steam serves to keep the water in constant motion and to raise its temperature. The pipes B are heated, preferably, by exhaust-steam, and the water heated by these pipes in turn heats the boulders, and when heated the boulders attract the heavier impurities, such as lime, as a magnet does iron.

From the tank C the water flows into the trough or passage-way D, and as this heated water emerges from the tank and strikes a colder stratum of air the water instantly begins to deposit its impurities upon the bed of gravel and rocks placed in the trough. From the bottom of the tank extend suitable pipes D′, by means of which the impurities deposited therein may be drawn off at will.

I find in practice that a gutter from fifty to one hundred feet in length is sufficient for the passage of the water to the next station, provided the trough is sufficiently wide to cause the water to run in a shallow stream. Throughout the passage of the water through this trough it is subjected to a continuous contact with the boulders and gravel, and during which period the air comes in contact with its surface, thereby lowering its temperature and causing a rapid precipitation of the lime and other impurities contained in the water upon the gravel and boulders. The water upon leaving the gutter D empties in the tank E, which is heated by means of exhaust-steam introduced through the pipe D^3. The end of this pipe is turned downward in the tank, so that the water in the trough and the water which is discharging will come in direct contact with the steam as it rises upward and which steam serves to heat the water in the tank to a high temperature.

The water as it flows from the trough D is bright and sparkling as it falls into the tank E; but the moment this water comes in contact with the steam from the pipe D^3 it becomes roily and something of the color of milk. The water then flows from this heating-tank E into the vessel F, which is provided with one or more compartments F′, which are formed by means of a series of barriers or dams G. In practice I have found that one dam gives good results but a greater number may be used, if desired. The moment the water begins to flow into the vessel and strikes fresh air the impurities begin settling in the compartment or compartments formed in the vessel F. As the water falls from this vessel F into a series of troughs I, which are preferably V-shaped, it loses some of its high temperature and begins precipitating or settling its impurities rapidly. From these troughs the water drips upon the filtering-cloth M, which is placed upon a bed of gravel N, placed in the tank O, and upon this filtering-cloth the remaining impurities are deposited. The tank O is placed in a larger tank P, and between the two tanks a sufficient space is left for the free circulation of air. The filtering-cloth may be of any suitable material or thickness, and the bed of gravel will be sufficiently thick, about three feet, to thoroughly filter the water before it passes into the large receiving-tank P. As the water falls from the tank O it passes through an air-chamber of a height of five or six feet in very small drops or spray, and in passing through this air-chamber it becomes thoroughly aerated. The water that is then drawn off from the large tank P is bright, sparkling, and clear as crystal and possesses all the life and freshness of dropping rain. While the water is made almost absolutely pure, it is not flat or dead, like distilled water, but is sparkling and lively.

The water coming from the wells sparkling like a diamond still is heavily impregnated with bicarbonates of lime and magnesia, sulfate of lime, ammonia, nitric acid, and other minerals. After passing through my apparatus it becomes almost absolutely pure, and the life of the water is preserved during the process.

An analysis of the water before and after passing through my apparatus shows as follows:

[Under "A" is shown the condition of the water as it comes from the wells. Under "B" is shown the condition of the same water after passing through my filtration process.]

	A.	B.
Total residue	45.80 parts	20.20 parts.
Loss by calcination	5.40 parts	3.80 parts.
Residue after calcination	40.40 parts	16.40 parts.
Lime	13.20 parts	1.40 parts.
Magnesia	5.90 parts	3.04 parts.
Sulfuric acid	5.50 parts	3.02 parts.
Chlorin	4.43 parts	2.84 parts.
Nitrous acid	Large traces	None.
Ammonia	Traces	None.

The time required for the water to pass through my apparatus from beginning to end is less than five minutes.

Although any kind of boulders may be used, I have obtained the best results from those formed from limestone.

Having thus described my invention, I claim—

1. In an apparatus for the purification and filtration of water, a series of steam-heated pipes over which the inflowing water is made to pass, and an open tank placed beneath the pipes, combined with piles or beds of heated rocks or boulders placed in the tank below the pipes and upon which the water is made to fall for the purpose of depositing a portion of its impurities, substantially as shown.

2. In an apparatus for the purification and filtration of water, a series of steam-heated pipes, an open tank placed below said pipes, and pipes extending to the bottom of the tank and discharging the steam directly into the water in the tank, combined with piles or beds of heated rocks or boulders which are placed under the pipes, and over which the water is

made to pass, and which stones are heated by the dropping water so as to cause the water to deposit a portion of its impurities upon them, substantially as described.

3. In an apparatus for the purification and filtration of water, a series of pipes adapted to be heated and over which the incoming water is made to pass, an open tank placed below the pipes, beds or piles of boulders placed below said pipes in the tank, and troughs containing boulders and gravel leading from the tank, combined with a tank into which the water from the troughs passes, and a steam-pipe for heating the water in the tank, substantially as set forth.

4. In an apparatus for the purification and filtration of water, a reservoir for the initial reception of the water, said reservoir having a perforated bottom, a plurality of steam-pipes upon which the water is sprinkled and given an initial heating, a tank placed below the pipes, and beds of boulders upon which said water is discharged after leaving said pipes, combined with a steam heating-tank located a remote distance from said pipes, a long gutter or gutters interposed between the bed of boulders and said heating-tanks, a receiving vessel provided with a dam over which the water discharges as it issues from the said heating-tank, a series of troughs into which the water is discharged from said dam, and a filtering means placed beneath the troughs, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

ADAM SCHANTZ.

Witnesses:
F. A. LEHMANN,
ROSANN SMITH.