(No Model.)

J. G. HEYWOOD.

APPARATUS FOR PURIFYING SEWAGE.

No. 392,606. Patented Nov. 13, 1888.

Fig. 2

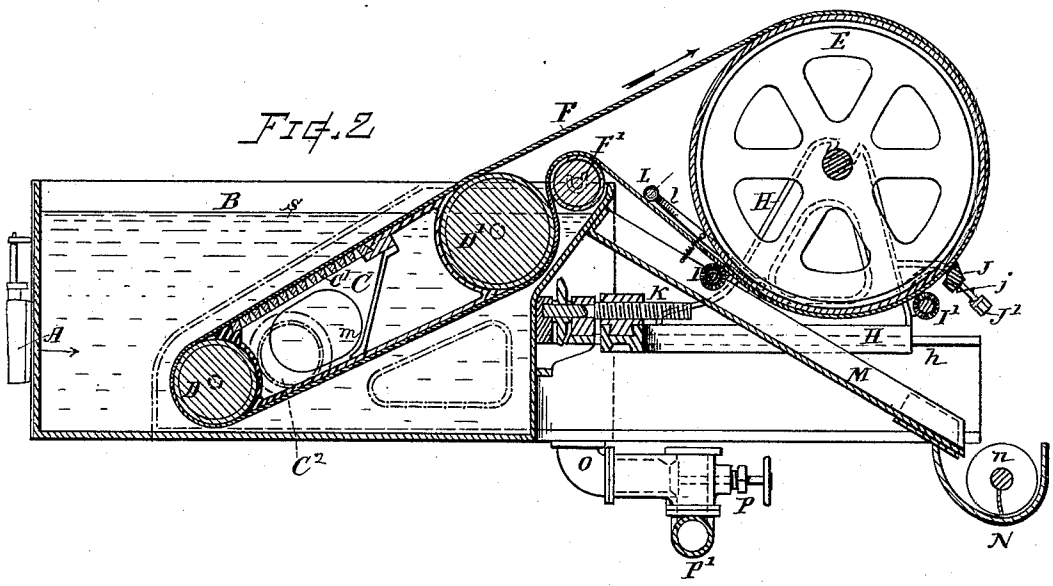
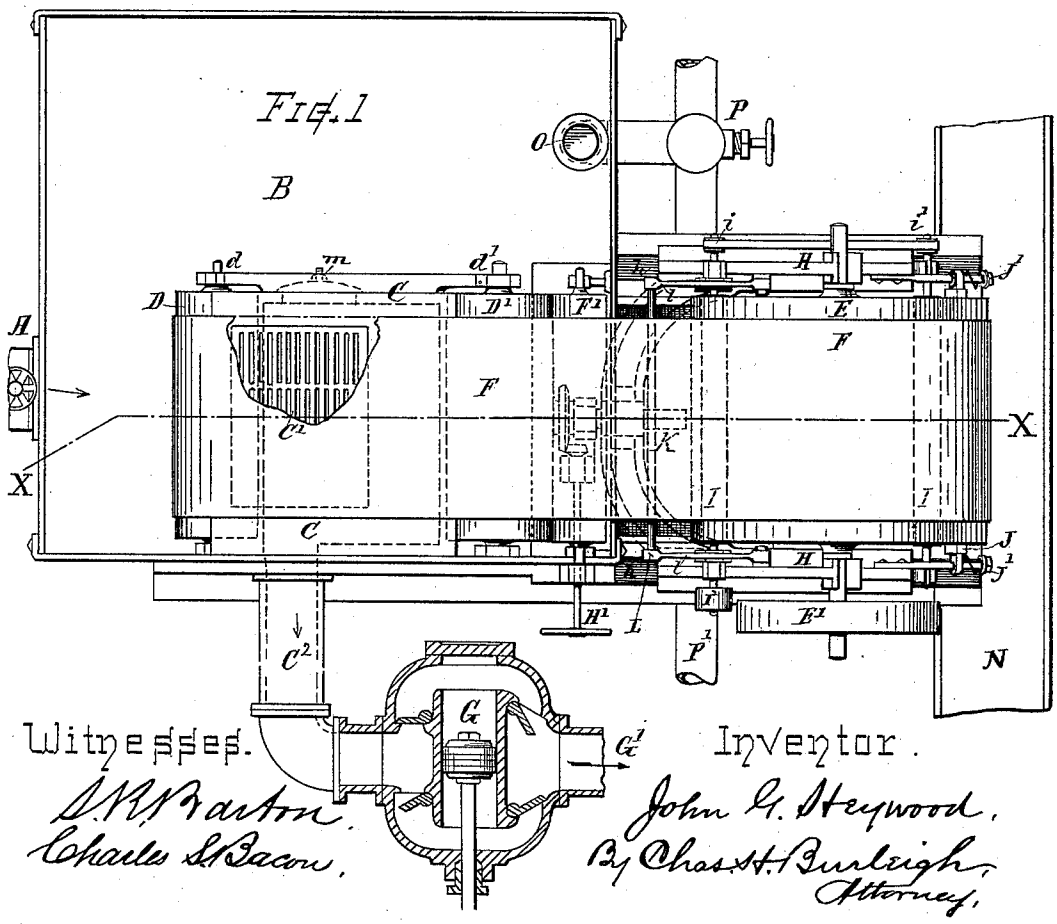


Fig. 1



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APPARATUS FOR PURIFYING SEWAGE.

SPECIFICATION forming part of Letters Patent No. 392,606, dated November 13, 1888.

Application filed January 16, 1888. Serial No. 260,946. (No model.)

To all whom it may concern:

Be it known that I, JOHN G. HEYWOOD, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Purifying Sewage, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The object of my present invention is to provide an efficient mechanism in which forced pressure is employed for separating the solids from the liquid in the purification of sewage, and also to afford convenient means for cleansing the filtering-surface and discharging the sludge while the apparatus is in continuous operation. These objects I attain by mechanism the nature, construction, and operation of which are explained in the following description, the particular subject-matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a plan view; and Fig. 2 is a vertical section at line X X, showing mechanism constructed in accordance with my invention.

My improved mechanism comprises a tank or chamber, into which the sewage is delivered, a submerged perforated suction-box, over which a continuously-traveling filtering-belt which passes into and from the tank is drawn while the interior of said suction-box is exhausted by a suitable pumping mechanism, a set of guiding-rolls that carry the filter-belt in such manner that only one surface is exposed to the unfiltered sewage, and devices whereby the filtering-belt is cleared as it advances and the sludge removed therefrom, the mechanism being organized for operation as a filtering-engine, as follows:

Referring to parts, A denotes the supply-pipe, through which the sewage enters from any source, a suitable gate being provided for regulating the flow and quantity delivered as required.

B denotes the tank, reservoir, or chamber into which the sewage is delivered for treatment.

C indicates the suction-box, which is disposed in an inclined position within the tank B and provided with a perforated top plate or grating, C′, that occupies a submerged position when the tank is filled and the sewage-water is at its normal level, as indicated at S in Fig. 2. The suction-box is completely closed, except the perforations of the grating C′ and the exit-passage or suction-pipe C^2.

D and D′ indicate guiding-rollers arranged in recesses at the ends of the suction-box, and E denotes an operating-drum located outside the tank, which rolls and drum, together with the guide-roll F′, support and carry the endless traveling filtering-belt F, which belt passes around the suction-box C, fitting against its bottom and top surfaces and against the rolls D D′, and seated closely upon the grating C′ and entirely covering the openings in the same. The roll F′ is placed so as to guide the filter-belt over the front rim of the tank, and also in such position as to direct said belt against the face of roll D′, above the surface level of the sewage S. Thus one face of the filtering-belt — that which runs against the suction-box—is protected from contamination, the sludge being deposited only upon the outer surface of said filter-belt. The belt F may be made wholly or in part of fibrous material—as cloth, felt, or other suitable fabric—and with metal strengthening-strands, if desired. I also propose to use in some instances a belt made of fine woven-wire fabric, provided along its edges with a binding or border of cloth, rubber fabric, or other material, for strengthening the belt and giving bearing along its edges on the surface of the filter-box.

The suction-box C is preferably constructed and disposed to overhang or project from the side of the tank, the bearings *d d′* of the rolls D and D′ being attached to the suction-box, so that the end of said suction-box will stand clear of any support other than that of its end, which is connected with the frame or side of the tank. This overhanging construction permits of the filter-belt F being readily slipped on and off the suction-box and rolls D D′ laterally within the tank for renewal or repairs, the tank B being made of sufficient width to accommodate and permit the convenient removal of the belt laterally. The

filtering-belt covers the submerged suction-box grating, so that the liquid entering the suction-box passes through the filtering-belt.

A suitable exhauster or pump, G, is connected with the pipe C^2, leading from the suction-box, which, when operated by steam or other power, tends to produce a partial vacuum within the suction-box, thus inducing a forced pressure or suction of the liquid through the grating C′ and corresponding portion of the filtering-belt F, the same being at a position wholly submerged beneath the sewage, while no material pressure is exerted at other portions of the belt.

The drum E is mounted on standards or a frame, H, which is adjustable for straining and loosening the filtering-belt F, said frame being supported on guideways *h* and provided with an adjusting-screw, K, (one or more,) arranged to be operated for moving the drum E toward or from the tank B by the shaft and hand-wheel H′, and suitable gearing combined therewith. The shaft of the drum E is provided with a pulley, E′, for a driving-belt, or with other suitable means for effecting rotation of said drum for operating the filtering-belt F from any efficient motor.

J indicates a scraper for removing the sludge from the filtering-belt F. Said scraper extends across the belt on the face of the drum E, and is supported on suitable hangers, J′, at its ends, springs *j* being provided for pressing the scraper against the surface of the belt.

I and I′ indicate revolving brushes that sweep the surface of the traveling filtering-belt. Said brushes are mounted on bearings on the frame H, and are rotated by suitable belts on their pulleys *i*, *i′*, and I^2.

L indicates a striker bar or beater for shaking that portion of the filtering-belt which is between the drum E and the guide-roll F′ at the edge of the tank. Said beater consists of a bar mounted on the ends of swinging arms *l*, that are pivoted on the frame H and vibrated by cams or lugs on the shaft of the brush I, or in other equivalent manner.

A trough or inclined floor, M, is arranged beneath the drum and belt-clearing devices for receiving the semi-liquid sludge which falls from the filtering-belt and directing it into the conveyer N, whereby it is carried to a suitable receiving-vat or other convenient place of deposit.

O indicates the outlet, provided with a stop-gate, P, for draining off the contents of the tank B when desired to clean it out or for repairs.

P′ indicates the pipe for carrying off the contents to any desired place or to be pumped back into the head-reservoir.

The suction-box C is preferably made with a man-hole having water-tight cover, as at *m*, to permit access to the interior thereof.

In the operation of my apparatus the sewage is delivered to the tank B, and by the pump G is drawn out from the suction-box C, while the filtering-belt F is advanced by a continuous forward motion in the direction indicated on Fig. 2. The sewage-water passes from the tank down through the belt F and gratings C′ into the submerged suction-box, and thence to the exhauster or pump G, and leaves the solid matter or sludge deposited upon the outer surface of the filter-belt F, where it reposes while it is carried up the incline, out of the tank, and over the drum E to the scraper J, which scraper removes the greater portion of the sludge from the belt, the balance being removed by the brushes I I′ and beater L, and it falls upon the trough M and drips through the conveyer N, by which it is carried to the desired place of deposit, the solids being thus discharged by way of said conveyer, while the effluent water or liquid is discharged through the leader of the pump at G′.

In another application for Letters Patent, Serial No. 260,945, I have described a filtering-engine—such as herein claimed—as employed in connection with other mechanism in a plant for treating sewage; and the claims in this my present case embrace features of construction in the filtering-engine itself, while the claims of my other application embrace the combination of a filtering-engine with other mechanisms.

I am aware that movable screens and belts of filtering material have heretofore been employed for various purposes, and I do not therefore make claim, broadly, to a traveling filter-belt irrespective of the construction and arrangement of mechanism wherein such belt is employed.

What I claim as of my invention, and desire to secure by Letters Patent, is—

1. The combination, with the receiving-tank, of a stationary submerged perforated suction-box, an endless filtering-belt traveling over said suction-box, and means for exhausting the air and water from the interior of said suction-box, for the purpose set forth.

2. The combination of the submerged suction-box supported at inclined position and having openings in its top, the inclined filtering-belt seated upon and traveling over the openings of said suction-box, and an exhauster for sucking air and water therefrom, substantially as and for the purpose set forth.

3. A filtering-engine consisting of a tank having inlet and drainage passages, a submerged suction-box having a perforated side or grating fixed within said tank, an exhauster-pump connected with the interior of said suction-box, and an endless filtering-belt disposed in inclined position to travel over the surface of said submerged suction-box grating, in combination with a belt-operating drum and belt-clearing mechanism located outside of said tank and operating substantially as hereinbefore set forth.

4. The combination, substantially as described, of the tank B, the submerged suction-box C, having the grating C′, the guiding-rolls D, D′, and F′, the inclined filtering-belt F, and

the operating-drum E, for the purposes set forth.

5. The combination, substantially as described, of the tank B, the suction-box C, having the grating C′, guide-rolls D, D′, and F′, the endless traveling filtering-belt F, the scraper J and its operating-drum E, and sludge-conveyer N, for the purpose set forth.

6. The combination, with the tank B, the inclined submerged suction-box C, and endless traveling filtering-belt F, of guide-rolls D D′, fitted to recesses in the ends of said suction-box, and the guide-roll F′, disposed in position to direct the filtering-belt against the surface of the roll D′ above the water-level, as hereinbefore set forth, whereby only the outer surface of the filtering-belt is presented for contact with the unfiltered sewage.

7. An overhanging suction-box supported upon and projecting from the side of the tank, in combination with the filtering-belt, belt-carrying rolls, and a tank of sufficiently greater width than the suction-box to permit the removal of the filtering-belt from said suction-box laterally within the said tank, as hereinbefore set forth.

8. The combination, with the conveyer N, trough M, filtering-belt F, and its operating-drum E, of the scraper J, rotary brushes I I′, and beater L, for the purpose set forth.

9. The combination, with the tank, suction-box, traveling filtering-belt, its operating-drum, and a guiding-roll, F′, disposed near the edge of the tank, of a beater, L, arranged for acting upon that portion of the belt between said drum and guiding-roll, substantially as and for the purposes set forth.

10. The combination, substantially as described, with the suction-box, guiding-rolls, endless traveling filtering-belt, and belt-operating drum, of the adjustable drum-supporting frame H, its adjusting-screw *h* and screw-operating gears, and shaft H′, for the purposes set forth.

Witness my hand this 7th day of January, A. D. 1888.

JOHN G. HEYWOOD.

Witnesses:
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