

No. 691,365.

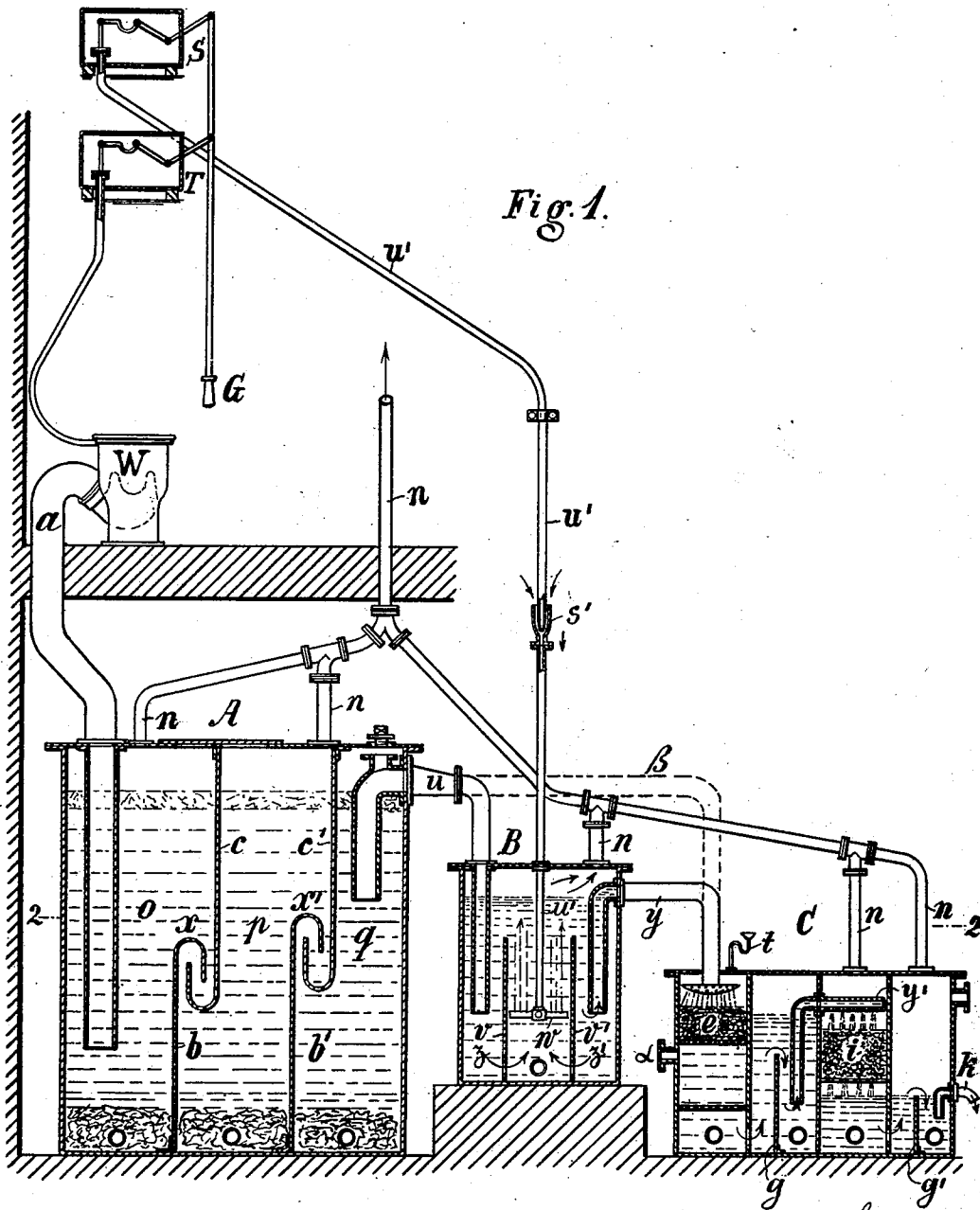
Patented Jan. 21, 1902.

F. W. DITTLER.
APPARATUS FOR CLARIFYING FECAL MATTER.

(Application filed Sept. 28, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
October
B. Sommer

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by *Neu* *10th of*
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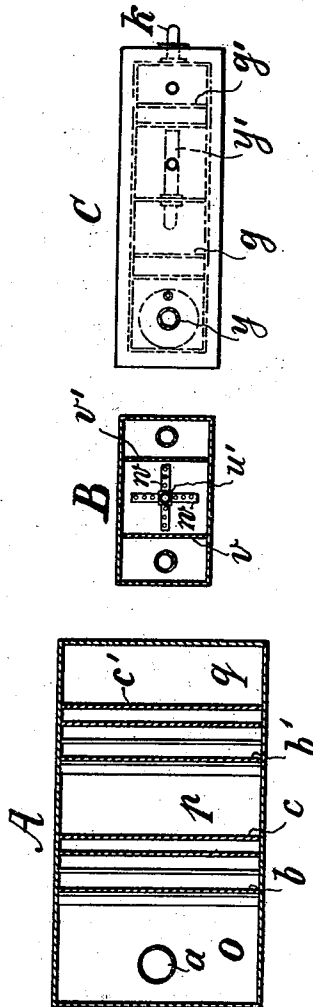
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(No Model.)

2 Sheets—Sheet 2.

Fig. 2.



Witness:
Attest
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UNITED STATES PATENT OFFICE.

FRIEDRICH WILHELM DITTLER, OF BERLIN, GERMANY.

APPARATUS FOR CLARIFYING FECAL MATTER.

SPECIFICATION forming part of Letters Patent No. 691,365, dated January 21, 1902.

Application filed September 26, 1901. Serial No. 76,676. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH WILHELM DITTLER, a subject of the Grand Duke of Baden, and a resident of Berlin, Germany, have invented certain new and useful Improvements in Apparatus for Clarifying Fecal Matter; and I do hereby 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 letters of reference marked thereon, which form a part of this specification.

The systems of clarifying fecal matters hitherto proposed, which are based on the bacteriological principle, have not been capable of being introduced in practice because they either require a very large area of ground for the apparatus or because where the area is limited they do not work in a satisfactory manner, and, further, all arrangements of such clarifying systems are too expensive, both in the cost of fitting up the plant and apparatus and also to a still greater extent in the cost of working. These drawbacks are removed by the clarifying system which forms the object of the present invention, which will now be more particularly described with reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of the apparatus, and Fig. 2 a plan view partially in section.

The apparatus consists, as a rule, of three tanks A B C, of which the tanks A and C are always necessary, while the tank B may under certain favorable circumstances be dispensed with where the liquefaction and decomposition of the fecal matter has proceeded sufficiently far for the hereinafter-described treatment in the tank C to be at once proceeded with. This possibility may be ascertained by testing and experience. As in most cases, however, it appears preferable for the sake of a sure working to utilize the tank B, also the use of the three tanks A B C will in the system hereinafter described mainly form the basis for the explanation of the invention. These tanks A, B and C are made according to the dimensions necessary for the work in each particular case, either

transportable, of boiler-plate, or stationary, of cement, (Monier). They are connected with one another by washered pipes *u y*. In case tank B is not to be employed the pipe *u* may be directly connected with the pipe *y*, as shown in the drawings, by the pipe β , (indicated in dotted lines.) The covers and any existing manholes in the tanks A B C are tight-jointed, and the gases evolved are conveyed to a chimney-shaft through nozzles connected with the covers of the said tanks and pipes *n*, so that the working is thoroughly free from odor.

The tank A is divided into three or more compartments *opq* by peculiarly-constructed partial vertical partitions *b b'* and partial suspended ones *c c'*, always two by two, engaging with one another at *x x'*, the siphon-like passage *x* between the first pair of partitions being the lowest, while the next succeeding passage *x'* or passages stand somewhat higher than the preceding, until finally the opening of the discharge-pipe *u* is reached at about three-fourths the height of the tank; but the latter must not be placed higher. This siphon-like construction of the passages between the standing and suspended partitions has for its object to maintain the contents of the tank as quiet as possible, even where there is an abnormally-rapid inflow through the pipe *a* from the closet or closets W, and thus not only to produce as rapidly as possible the bacteriological decomposition, but also to considerably assist in this decomposition by maintaining the resultant warmth in the tank A for as long a period as possible.

The tank B contains only two vertical partitions *v v'*, which are perforated near the bottom, so that when the blowing and oxidizing apparatus is set in action the whole contents of the tank is caused to circulate in the manner indicated by arrows *z z'* before it quits the tank through the pipe *y*. The blowing apparatus *s'* is automatically operated from the closet, as will be hereinafter described, a pipe *u'* from the flush-tank S, intended for the purpose, conveying water through *s'* to the tank B. A distributing-pipe *w*, consisting of several tubular arms perforated upward, allows this water and the air carried with it to escape into the tank B. Further, the cistern T is the flushing apparatus for the closet, which is set in action by

a handle or coupling device *G* simultaneously with the tank *S*.

The tank *C* contains a peculiarly-constructed coke and oil filter *e* on a perforated support, the object of which is to sterilize the liquid flowing through it. The hopper *t* serves for conveying oil, as hereinafter described, to the coke of the filter *e*. Any oil carried away from the oil-filter *e* is retained by straining-tongues *g* and *g'* and a dry coke filter *i* in the ordinary manner, to which latter a pipe *y'* leads. It suffices to state as regards this apparatus that the liquid flowing through it quits it at the pipe *k* absolutely free from oil and sterilized.

All the tanks *A*, *B*, and *C* are of course provided with manhole-covers and lower sludge-pipes in order that a cleansing of the same and an examination of their good condition may be undertaken once in every two or three years.

The tanks *A* and *B* have nowhere a tap, valve, or other mechanism which of itself requires watching or attention. Even the tank *C* has only one feed-hopper *t* and a tap *α* for letting off oil, both of which, however, are used at the most once or twice in four to six weeks and then only for a few minutes. In this manner it is possible to obtain a perfectly certain automatic continuous and approximately costless working.

The three apparatuses *A*, *B*, and *C* are independent locally one of the other, and therefore admit not only in houses of a utilization of very small space, but also in the separate houses only the tank *A* need be erected, a pipe from each discharging into the tanks *B* and *C*, which are common to all and are erected in any suitable position outside the houses, thus allowing of an arrangement on this system for dealing with the sewage of an entire town.

The apparatus in its construction is extremely cheap, as for a large dwelling-house occupied by about thirty people a tank *A* of one and one-half cubic meters suffices (*B* and *C* are small and cost almost nothing.) Still greater differences exist in the operating expenses of known systems as compared with the expenses inherent to my improved system, which latter are exceedingly low, as appears from the following: The fecal matter falls with the paper and other matters under the modern water-flush *T* out of the closet *W* through the pipe *a* into the first compartment *o* of the tank *A*. The heavier constituents fall to the bottom, the lighter rise to the surface, and after a short time the bacteriological fermentation and decomposition commences with vigorous evolution of gases, which are drawn off through the pipe *n* into this chimney. This evolution of gas indicates the decomposition and solution of the solid constituents of the fecal matter into a fluid and is principally produced by means of two kinds of micro-organisms—the aero microbes and the anæro microbes. Somewhat

above the middle of the height of the tank a portion of this liquid is separated out which has proceeded furthest in decomposition, and in consequence of a subsequent pressure from the closet after it has lost already a large part of its carbonic acid, nitrogen, and sulfur constituents in the form of gas is forced over through the siphon-like passage *x* into the second compartment *p* of the tank *A*. Although in this siphon-like passage now and then a small amount of matter which is not yet entirely fluid may remain, no danger of stopping up exists, because it is a matter of only about half an hour to render fluid these few adhering substances and to cause them to disappear. At the same time, however, the passage of any solid substances to *p* is entirely prevented. In consequence of this action of the siphon-like passage a product is obtained in the compartment *o* which is already highly decomposed, (decayed,) the qualities of which product greatly facilitate the further purification. After the process of decomposition has proceeded to a moderate extent in only one compartment *p* the resulting fluid has a higher specific gravity than that produced in the compartment *o*. The siphon-like overflow *x'* from the compartment *p* to the compartment *q* must therefore be placed somewhat higher than that leading from *o* to *p* if the fluid passing to *q* is to be correctly fermented, which fluid now (in the compartment *q*) no longer evolves gas. It smells still slightly of sulfureted hydrogen, (H_2S) is yellowish and slightly turbid, and in addition to the gases remaining in solution contains also the so-called "anæro microbes," which remain in life, as air is carefully excluded from the tank *A*, while the other kinds of bacteria—the aero microbes—die from want of oxygen.

In order to remove from the fluid left in the tank *A* any bacteria still living and also dissolved gases, the overflow is conveyed through the pipe *u* into the blowing and oxidizing tank *B*. This is, as already hereinbefore mentioned, divided into three compartments by means of two partitions perforated at their bottom, the middle one of which serves for forcing air and water in a peculiar manner into the fluid coming from the tank *A*, and thereby causing it to vigorously circulate in the direction indicated by the arrows, and expelling the dissolved gases as far as possible, as well as killing the bacteria by the air introduced. For this object the flush apparatus *S* in the closet *W* is simultaneously set going by the person using it with the flush apparatus *T* by means of the pull *G*. The water discharged from the flush-tank *T* forces the fecal matter through the pipe *a* into a tank *A*, while the water leaving the cistern *S* passes through an air-suction valve formed in the pipe *u'*, in this manner is charged with air, and thus prepared flows through the distributor *w* in the tank *B* and is discharged from it in various directions, the tubular arms of the said distributor being perforated on their

upper sides. The water charged with air thus passes out upwardly and forces the liquid entering simultaneously from the tank A to pass through the holes $z z'$ of the distributor w before it can quit the tank B. It is thus rendered entirely impossible for any part of the fluid transferred from A to B to retain its dissolved gases and any bacteria still living. The former are here also conveyed through the pipe n into the chimney. The latter remain dead as a slight muddiness in the liquid and are subjected in the tank C to a sterilization and filtration in the following manner: In order to permanently sterilize (to render safe from decomposition) the now entirely decomposed oxidized liquid, which is also freed from gas, it is passed through the pipe y over a box e , open above and having its bottom perforated and filled with coke and saprol or another easily-sterilizing oil. The liquid soaks slowly through the coke in through contact with the saprol or other oil and then leaves the same. After it has been freed in the ordinary manner from any traces of oil carried along with it (decantations and a dry coke filter lead to the first overflow y') it is discharged through a pipe K and is now absolutely innocuous for human beings, animals, and plants. In case epidemics arise the tank C may of course very easily be utilized as a disinfecter, a strong disinfectant being poured therein instead of saprol or similar easily-sterilizing oil.

The advantages of this improved clarifying process for fecal matter are very apparent.

First. The whole apparatus requires very small space, as its three tanks may be placed at any suitable distance from one another. About one to one and one-fourth cubic meters suffices for an average dwelling-house of twenty to twenty-five persons.

Second. The whole apparatus, whether large or small, may be cheaply constructed of cement, (Monier;) but similar installations may be made transportable, of boiler-plate or sheet-iron, and cost about one-third to one-fourth of the systems at present employed.

Third. The whole apparatus requires no inspections and attendance, as in the tanks A and B no valves or cocks or the like are necessary, and in the tank C there is only the feed-hopper t , and the recharging with oil, which is only necessary every four to six weeks, occupies a few minutes.

Fourth. The whole operation from commencement to finish is free from odor, and therefore any fouling of the air is made impossible. The tank A only requires to be inspected once every two or three years for the sake of order and the two other tanks B and C the same.

Fifth. Any cessation of the working at any abnormal time is impossible, because the thoroughly-carried-out bacteriological process when once started only goes on the more actively the longer it is in use, and because in the case of sudden outbreaks of epidemics it

is possible to more or less strongly disinfect the tank C.

Sixth. The working of even a large installation only costs a very small sum in comparison with all present known systems.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A clarifying apparatus for fecal matter and sewage, characterized by the clarifying-tank being divided into three or more chambers opq by means of two or more upright partitions $b b'$ in which one or more vertical partitions $c c'$ dependent from the cover are immersed in such a way that, in conjunction with the vertical partitions b facing them, the upper parts of which x like their own are suitably bent, they form a kind of siphon, in consequence of which the separated heavier matter as well as the floating substances remain at rest in the first chamber from which air is excluded in order to decompose by fermentation, so that the overflow of the sewage clarified by this decomposition only takes place from the middle of the tank through a pipe u , substantially as described and for the purpose set forth.

2. A clarifying apparatus for fecal matter and sewage, characterized by the clarifying-tank being divided by two or more vertical walls $b b'$ into three or more chambers opq in which one or more vertical walls dependent from the cover are immersed in such a way that they form a kind of siphon with the other walls $b b'$ standing opposite them the upper part of which walls, like that of their own is suitably bent $x x'$ in consequence of which arrangement the heavier matter separated out and also the floating substances remain at rest in the first chamber from which air is excluded in order to decompose by fermentation, so that the discharge of the sewage clarified by this decomposition only takes place from the middle of the tank through the pipe u , which pipe u leads by a pipe β to a tank C with filter-boxes e and i , which pipe β opens over a coke filter e to which a receptacle t conveys sterilizing and disinfecting oily liquids, said tank having baffle-plates g and g' for forcing the liquid to pass upward and between said baffle-plates, a dry filter-chest i with a handle y' , the liquid flowing off the latter over the baffle-plate g' through the apparatus escaping by means of an outlet k , substantially as described and for the purpose set forth.

3. A clarifying apparatus for fecal matter and sewage, characterized by the clarifying-tank being divided by means of two or more vertical walls $b b'$ into three or more chambers opq in which one or more vertical walls dependent from the cover are immersed in such a way as to form a kind of siphon between their lower edges and the upper edges of the walls $b b'$ facing them, the parts $x x'$ in question being suitably bent round, as a con-

sequence of which the heavier matters separated out as well as the floating substances are caused to remain at rest within the first chamber from which air is excluded in order
 5 to decompose by fermentation, the discharge of the sewage clarified by this decomposition only taking place from the middle of the tank through a pipe *u*, which leads by a pipe *β* to
 10 a tank C with filter-boxes *e* and *i* said pipe *β* opening above a coke filter *e* to which a receptacle *t* conveys sterilizing and disinfecting oily fluids, while said tank is provided with
 15 baffle tongues or plates for causing the liquid to pass upward, and a dry-filter box *i* with an inlet *y'* inserted between, while the liquid flowing off the latter over the baffle-plates *g'* through the apparatus can pass away through an outlet *k*, in which apparatus the pipe *u*

leads first into a tank B having two upright partitions *v v'* perforated near the bottom, 20 through an air-supply pipe *u'* having tubular distributing devices, the openings of which are upwardly directed in order to produce an upward flow of the liquid, the liquid being conveyed to the outside of these two walls, 25 while also outside these two walls *v v'* a discharge-pipe *y* connects with the said tank C substantially as described and for the purpose set forth.

In testimony that I claim the foregoing as 30 my invention I have signed my name in presence of two subscribing witnesses.

FRIEDRICH WILHELM DITTLER.

Witnesses:

JOHANNES HEIN,
 HENRY HASPER.