No. 646,927. Patented Apr. 3, 1900.

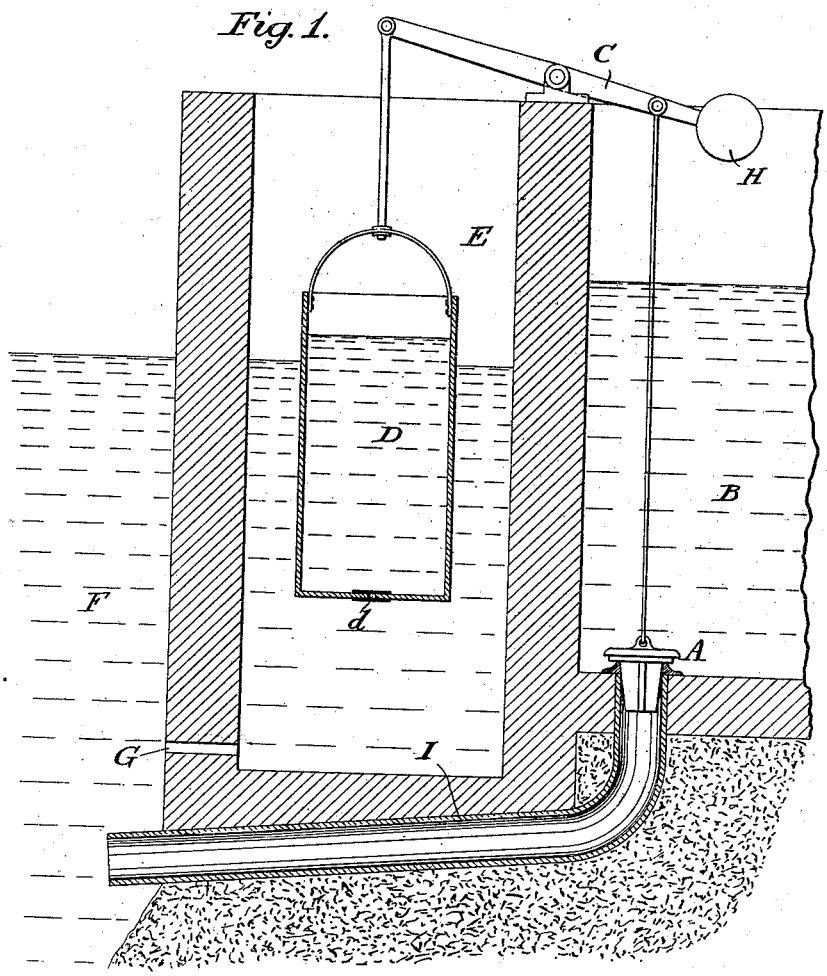
D. CAMERON, F. J. COMMIN & A. J. MARTIN.

DEVICE FOR REGULATING DISCHARGE OF SEWAGE INTO TIDAL WATERS.

(No Model.) (Application filed Nov. 7, 1898.)

4 Sheets—Sheet 1.

Fig. 1.



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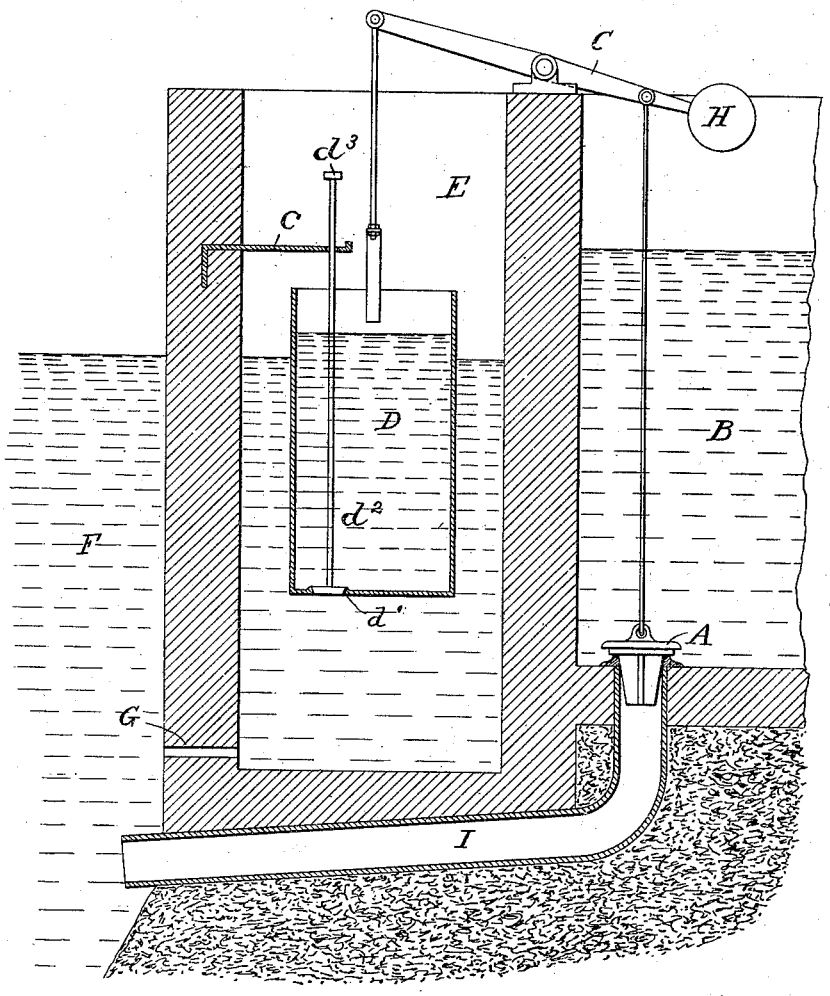
4 Sheets—Sheet 2.

Fig. 1a.



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DEVICE FOR REGULATING DISCHARGE OF SEWAGE INTO TIDAL WATERS.

(No Model.) (Application filed Nov. 7, 1898.) 4 Sheets—Sheet 3.

Fig. 2.

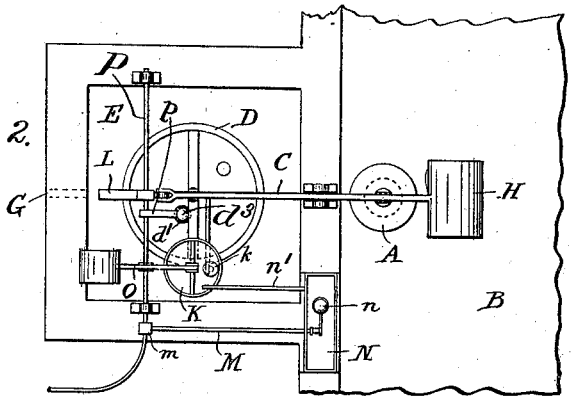
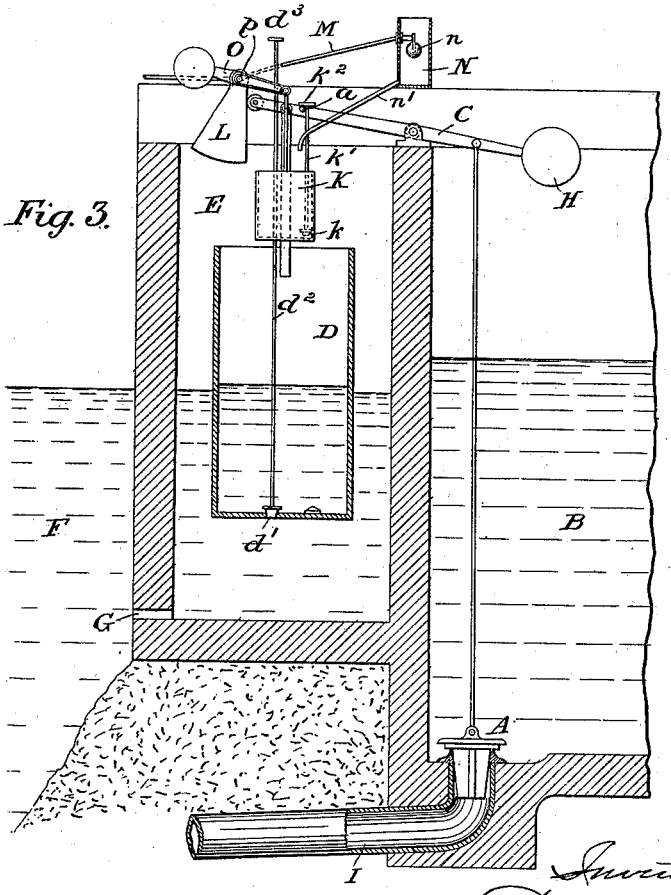


Fig. 3.



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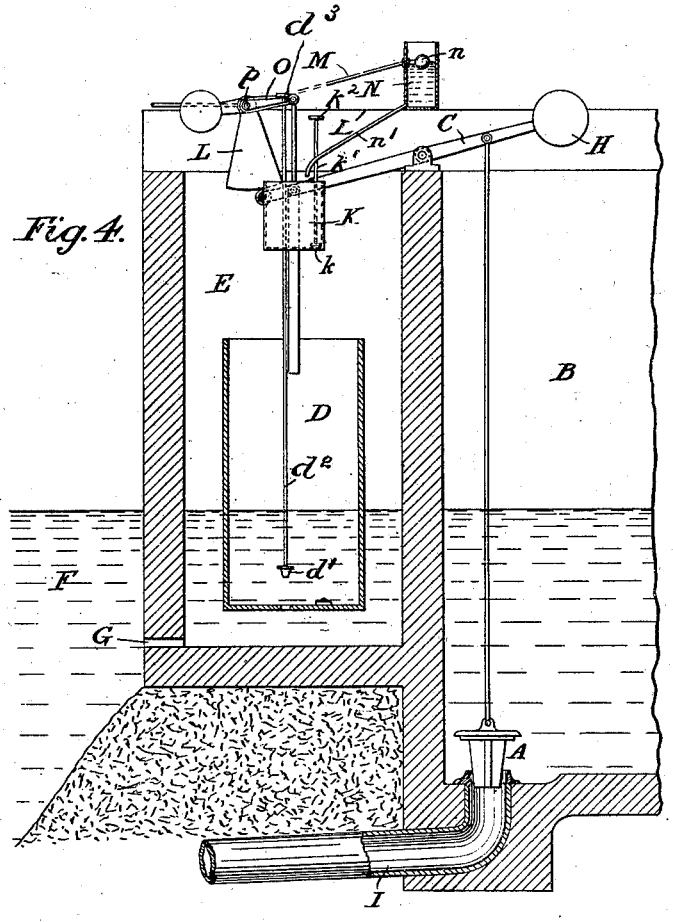
(No Model.) 4 Sheets—Sheet 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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DEVICE FOR REGULATING DISCHARGE OF SEWAGE INTO TIDAL WATERS.

SPECIFICATION forming part of Letters Patent No. 646,927, dated April 3, 1900.

Application filed November 7, 1898. Serial No. 695,786. (No model.)

To all whom it may concern:

Be it known that we, DONALD CAMERON, FREDERICK JAMES COMMIN, and ARTHUR JOHN MARTIN, subjects of the Queen of Great Britain, residing at Exeter, in the county of Devon, England, have invented a new and useful Self-Acting Valve for Regulating the Discharge of Sewage into Tidal Waters, (for which we have made application for Letters Patent in Great Britain, bearing No. 8,429, dated April 9, 1898, and No. 9,767, dated April 28, 1898,) of which the following is a specification.

This invention relates to the discharge of sewage, sewage effluent, or other liquid into tidal waters.

Where sewage is discharged into tidal waters, it is generally desired to restrict such discharge to certain states of the tide, the sewage which comes down at other states of the tide being stored in a tank or sewer. The discharge is generally regulated by valves, and such valves have hitherto, as a rule, been opened and closed by hand.

The object of our invention is to provide means for opening and closing such valves automatically. For this purpose we in all cases govern the opening and closing of the valves by means of the fall and rise of the tide; but the manner in which our invention is carried into effect will vary according to the size of the valves and the state of the tide at which it is desired that the discharge shall take place.

In order that our invention may be fully understood, we will proceed to describe same by the aid of the accompanying drawings, in which—

Figure 1 is a vertical section of an arrangement for carrying the invention into effect in the simplest manner. Fig. 1ª is a similar view of a modification of same. Fig. 2 is a plan view, Fig. 3 a vertical section, and Fig. 4 a similar section with the parts in another position, of an arrangement we employ when it is desired that the discharge shall take place during a certain specified period of time.

In the simplest forms of our invention (illustrated in Figs. 1 and 1ª) the valve A, controlling the discharge from tank B, is suspended from one end of a lever C, from the other end of which is hung a bucket or cylinder D, closed at the bottom and so placed that the tide can rise and fall around it. Such bucket is preferably placed in a well or chamber E, communicating with the tidal water F through a pipe or opening G. In the side or bottom of such bucket is an opening *d*, which might be closed by a valve opening inward, as shown in Fig. 1ª, or may be so small that the rise and fall of the water in the bucket D will lag behind the rise and fall of the tide, as shown in Fig. 1. The lever C, bucket D, and valve A are so balanced, either by their own weight or by the help of a counterweight H, that the valve A will tend to fall to its seat in the upper end of the discharge-pipe I. When the tide begins to fall, the level of the water surrounding the bucket D will sink below that of the water therein and the water so retained in the bucket above the level of the water outside will cause it to descend, opening the valve A, whereby the sewage stored in tank B will be released. The moving parts may be so balanced that the tide shall fall through a certain height before the valve is opened. If, as shown in Fig. 1ª, the opening *d* is provided with a valve, said valve may be opened when the bucket has fallen through a certain height, the valve-stem d^2 having a lug d^3, which engages a projection *c* in the construction shown in Fig. 1ª and opens the valve *d'*. In the constructions shown in Figs. 2, 3, and 4 the lug d^3 engages an arm *p* on the shaft P. The bucket being thus relieved of the weight of its contents will rise again into its higher position, closing the discharge-valve A. If, as shown in Fig. 1, the bucket is not provided with a valve, the contents will gradually escape through the orifice *d*, thus permitting it to rise and close the valve A. As an alternative the valve A may be held open by a catch L, which will be released when the tide has fallen to the desired extent.

In the arrangement shown in Figs. 2, 3, and 4, and which is designed so that the discharge shall take place during a certain specified period of time, the closing of the discharge-valve A is made dependent on the filling of a vessel K, which shall begin to fill as soon as

the discharge-valve is opened, the rate of filling being regulated by means of a valve or by the size of the supply pipe or orifice or otherwise, so that the vessel K may fill in the desired time. This vessel K is suspended from a lever O, which is fixed on a shaft P, having a catch L, also fixed thereon, which holds the discharge-valve A open. This catch L passes over the end of the lever C when the parts are in the position shown in Fig. 4; but when the vessel K is full it will descend, thereby causing the shaft P to turn in its bearings, withdrawing the catch L from the end of the lever C and allowing the discharge-valve A to close, as shown in Fig. 3. When this form is used, the actuating-bucket D should be emptied as soon as possible after the discharge-valve A has been opened, in order that it may be free to rise when the catch L is withdrawn. This may be conveniently effected by means of a valve d', whereof the valve-stem d^2 extends for some distance above the top of the bucket D and is provided with a lug d^3, which is adapted to be engaged by an arm p, fixed to the shaft P, on the falling of the bucket D, thereby opening the valve d' and emptying the bucket. The measured flow to the vessel K should begin at the same time. As soon as the catch L has been withdrawn the vessel K receiving the measured flow should be emptied, which may be effected by means of a valve k being caused to open by the lug k^2 on its extended valve-stem k' coming in contact with the pin a on the lever C on the descent of the vessel K or by the raising of the actuating-bucket D. The measured flow is preferably delivered to the vessel K from a cistern N, provided with a ball-cock n, which cuts off the supply when such cistern is full, the measured flow passing through a pipe n' from cistern N to vessel K.

The discharge-valve A may be closed by means of the measured flow already mentioned without the intervention of the vessel K above referred to. In this case the catch L will also be dispensed with and the water in the actuating-bucket D will remain therein in order to keep the bucket down. The water which causes this bucket to descend will occupy but a small part of its capacity and its flow will be cut off as soon as the bucket D falls; but the filling of the latter will be continued by the measured flow. When the bucket is full, it will be emptied either by a siphon or a valve opened by an overflow from the bucket D, and on being freed of its contents will rise, thus closing the discharge-valve A.

In some cases it will be desirable to place the storage-tank B at some distance from tidal water and to have the discharge-valve A in or near the tank. In such cases the arrangement already described may be placed close to the tank and the chamber in which the actuating-bucket D is hung connected with tide-water by a pipe, if the levels permit.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination of a receptacle provided with a discharge-valve, a vessel disposed in a tidal or rising and falling liquid and connected to said valve for automatically opening and closing it, said vessel being adapted to rise on the rise of the tide and close said valve, and to fall on the fall of the tide and open said valve, said receptacle being separate from the tidal or rising and falling liquid in which said vessel is disposed, and means for holding said vessel in lowered position for a predetermined period whereby the discharge-valve is held open during said period.

2. An improved self-acting valve comprising a lever, a valve suspended from said lever on one side of its fulcrum, a bucket connected with said lever on the other side of its fulcrum and disposed within a space in which liquid rises and falls, said bucket having an opening for the admission of such liquid for the purpose of causing the descent of the bucket when the level of the surrounding liquid falls, said valve being disposed in a tank separate from the rising and falling liquid.

3. An improved self-acting valve comprising a lever, a valve suspended from said lever on one side of its fulcrum, a bucket connected with said lever on the other side of its fulcrum and disposed within a space in which liquid rises and falls, said bucket having an opening for the admission of such liquid for the purpose of causing the descent of the bucket when the level of the surrounding liquid falls, and a catch for holding said lever down whereby the valve is held in open position.

4. An improved self-acting valve comprising a lever, a valve suspended from said lever on one side of its fulcrum a bucket connected with said lever on the other side of its fulcrum and disposed within a space in which liquid rises and falls, said bucket having an opening for the admission of such liquid for the purpose of causing the descent of the bucket when the level of the surrounding liquid falls, a catch for holding said lever down whereby the valve is held in open position, and means for releasing said catch.

5. The improved self-acting valve comprising a lever, a valve suspended from said lever on one side of its fulcrum, a bucket suspended from said lever on the other side of its fulcrum, and within a space in which a liquid rises and falls, said bucket having an opening for the admission of such liquid therefrom for the purpose of causing the descent of the bucket when the level of the surrounding liquids falls, a catch for holding one end of the lever in lowered position thereby holding the valve open, and a vessel connected with said catch, said vessel being filled by a measured flow and adapted to fall when it becomes full and release said catch.

6. A mechanism for actuating a discharge-valve comprising a catch for holding the valve in open position, a vessel for controlling said catch, and means for feeding a measured flow into said vessel, the material so fed causing the vessel to move thereby releasing the catch and permitting the valve to close.

7. The combination of a receptacle provided with a valve, a bucket disposed in a tidal or rising-and-falling liquid and connected to said valve for automatically opening and closing it, said bucket being adapted to rise on the rise of the tide and close said valve, and to fall on the fall of the tide and open said valve, a valve in said bucket, having a valve-stem extending above the top thereof, and means for engaging said valve-stem thereby opening said bucket-valve and emptying said bucket.

8. A self-acting-valve mechanism comprising a principal lever, a main valve suspended therefrom, a bucket connected to said lever, a valve in said bucket having an extended valve-stem, a shaft, and an arm fixed on said shaft for engaging the valve-stem of the bucket-valve on the falling of said bucket for opening said bucket-valve and emptying said bucket.

9. A self-acting-valve mechanism, comprising a principal lever, a main valve suspended therefrom, a bucket connected to said lever, a shaft, a catch fixed to said shaft and adapted to engage said principal lever and hold said main valve open, and a vessel connected with said shaft, said vessel being filled by a measured flow and adapted to fall when it becomes full and release said catch.

10. A self-acting-valve mechanism, comprising a principal lever, a main valve suspended therefrom, a bucket connected to said lever, a valve in said bucket having an extended valve-stem, a shaft, a catch fixed to said shaft and adapted to engage said principal lever and hold said main valve open, an auxiliary lever fixed to said shaft, a vessel suspended from said auxiliary lever, a valve in said vessel having an extended valve-stem, a pin on said principal lever adapted to engage the valve-stem of the vessel-valve on the falling of said vessel for opening said vessel-valve and emptying said vessel, an arm fixed on said shaft for engaging the valve-stem of the bucket on the falling of said bucket for opening said bucket-valve and emptying said bucket, and means for feeding a measured flow into said vessel for causing it to fall at determinate intervals to release said catch.

11. A self-acting-valve mechanism comprising a principal lever, a main valve suspended therefrom, a bucket connected to said lever, a catch adapted to engage said principal lever and hold said main valve open, a vessel connected with said catch and adapted to be filled by a measured flow, a cistern, a pipe leading from said cistern to said vessel, and means for regulating the supply to and discharge from said cistern.

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