

(No Model.)

G. E. WARING, Jr.  
SEWER CONSTRUCTION.

No. 601,742.

Patented Apr. 5, 1898.

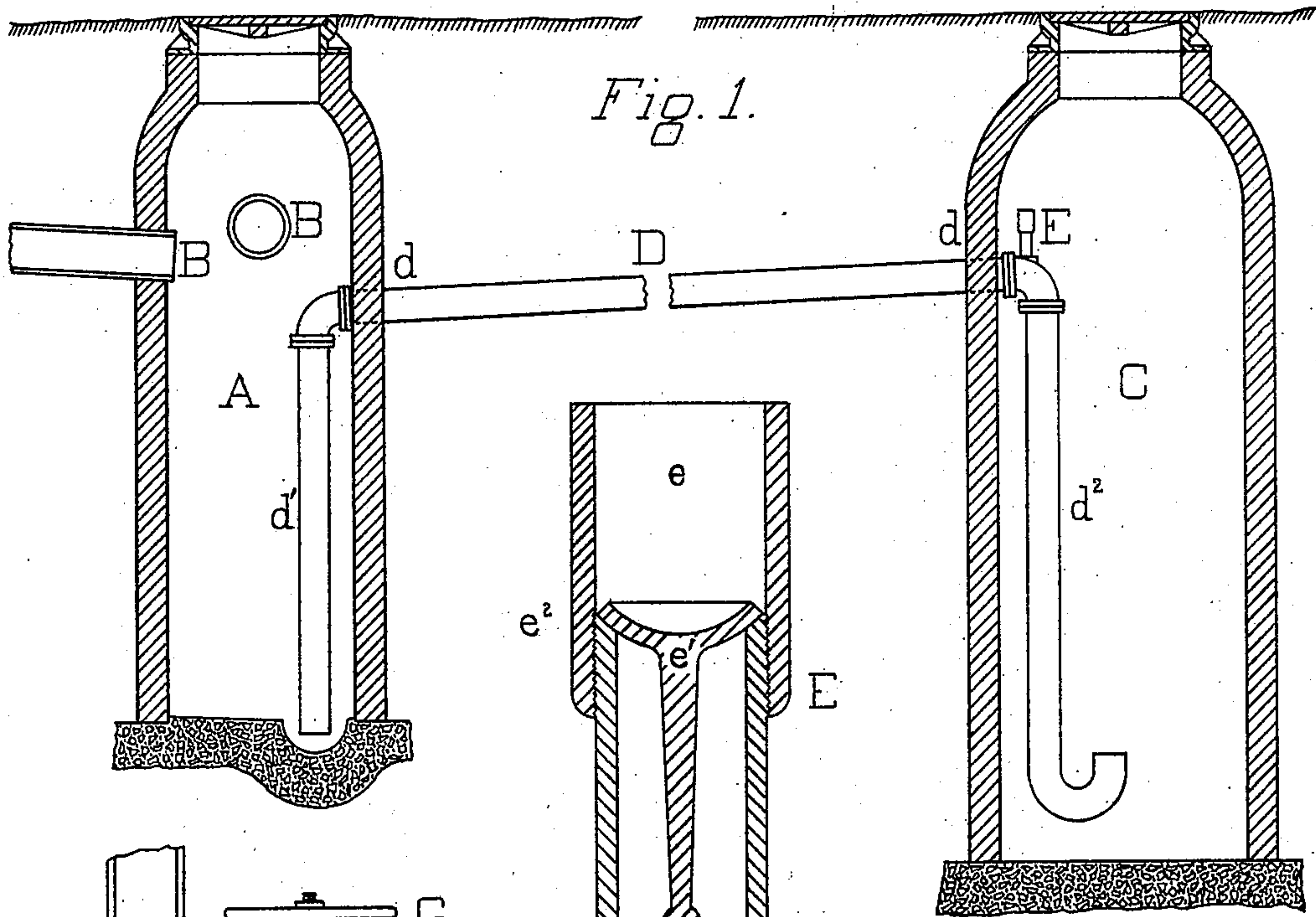


Fig. 2.

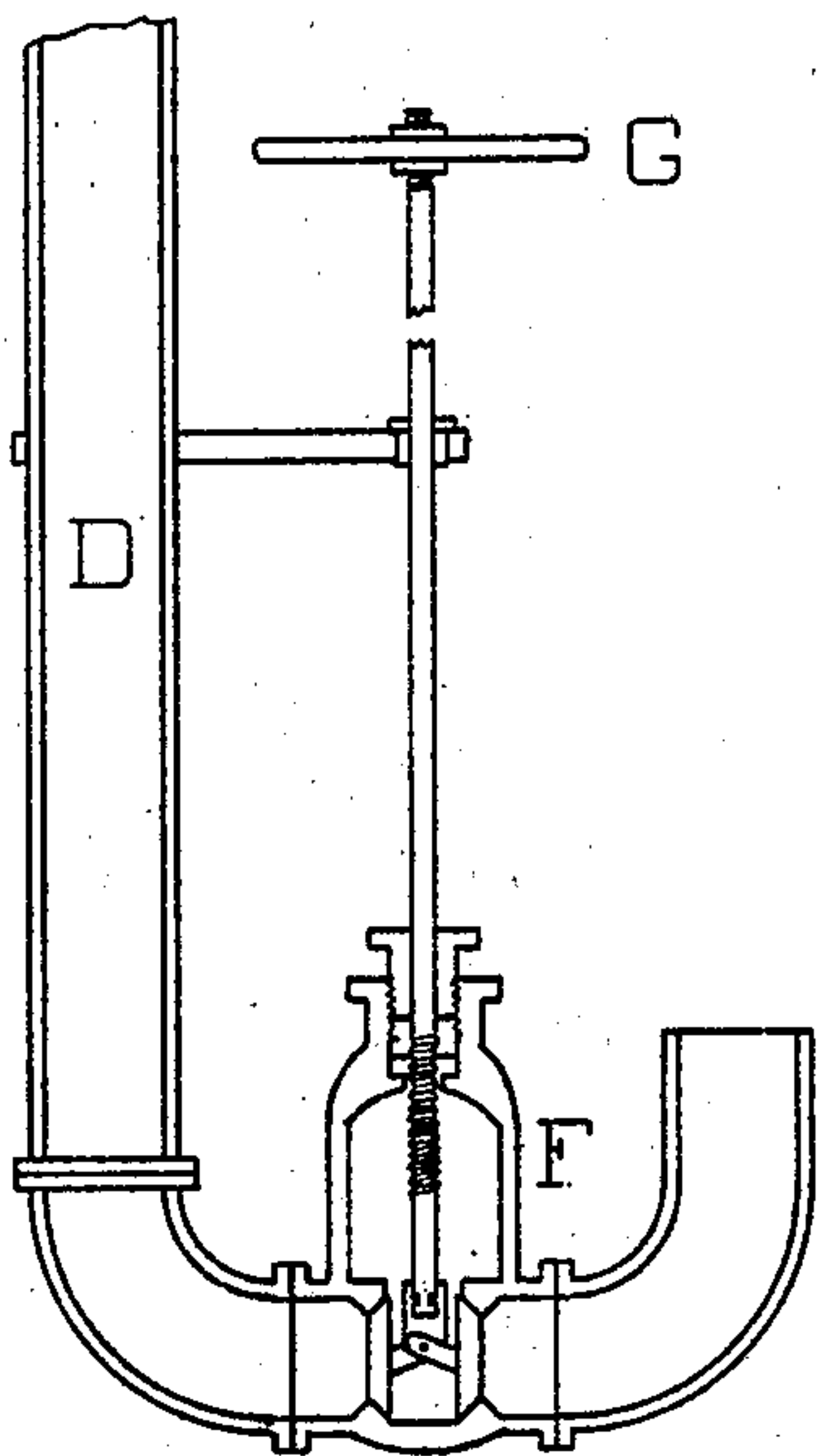


Fig. 4.

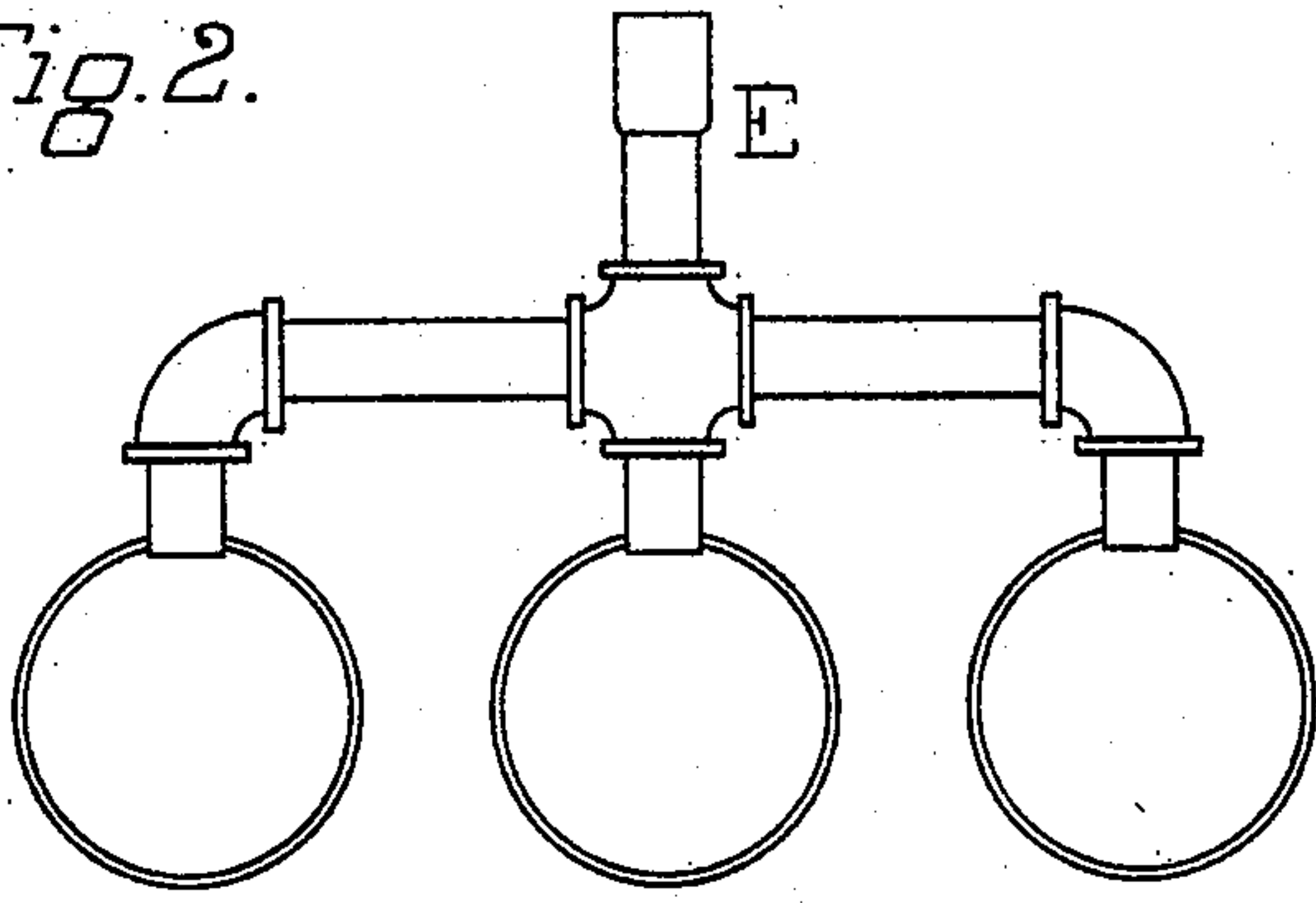


Fig. 3.

WITNESSES.

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# UNITED STATES PATENT OFFICE.

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## SEWER CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 601,742, dated April 5, 1898.

Application filed March 1, 1893. Serial No. 464,237. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE E. WARING, Jr., of the city and county of Newport, in the State of Rhode Island, have made a new and  
5 useful Improvement in Sewer Construction, of which the following is a specification.

In constructing sewers it is sometimes necessary to provide means for the transportation of sewage to points which cannot be  
10 reached by gravity-sewers or which can be thus reached only at undue expense. The siphon is one of many devices used to accomplish this end, and it possesses a great advantage over others in that it requires no local  
15 application of power for its operation, performing its functions solely by gravitation and atmospheric pressure and being, as nearly as any such device can be, automatic in its action. The only serious difficulty encountered in its use is a tendency to accumulate  
20 air taken in not only through imperfections in construction, but contained in the liquid passing through the siphon. This condition is greatly aggravated when the siphon is used  
25 for the transmission of sewage, which ordinarily contains a considerable amount of air, largely owing to the bubbles carried into it by the sudden discharge into the sewer from house-drains along its course and by the  
30 plunging of the stream of sewage as it falls from the sewer into the siphon-well. Such an accumulation of air interferes with the action of the siphon and, if excessive, will make the proper performance of its functions impossible. In siphons heretofore constructed  
35 for this purpose special pumping apparatus or an exhaust operated in connection with the system of water-supply or some similar device is provided to remove the accumulated  
40 air and to charge the siphon afresh.

The purpose of my invention, among other things, is to provide means whereby the above-mentioned accumulation of air may be automatically expelled and the siphon auto-  
45 matically recharged. This I do by fixing the elevation of the horizontal run of the siphon at such a height that by arresting the flow, as by closing the outlet of the discharging-well or by stopping the pumps—if the ultimate removal of the sewage is by pumping—the sewage will accumulate and rising will fill the

siphon, driving out the contained air at its highest point through a suitable provision for its escape and insuring the immediate operation of the siphon when the discharge begins  
55 again, all as hereinafter set forth.

The details of construction are shown in the drawings, in which—

Figure 1 is a sectional view showing two sewage-wells connected by a siphon which is  
60 charged by the accumulation of sewage to such a height as to submerge it. Fig. 2 is a section, on an enlarged scale, of a valve provided for the escape of air at the crown of a siphon when being charged by submersion. 65 Fig. 3 is a sectional view showing an arrangement of pipes by which one valve may be made to serve for the escape of air from two or more siphons discharging into the same well. Fig. 4 is a section of the discharging-  
70 limb of a siphon provided with a gate or valve for arresting the flow within the siphon and allowing the accumulation of sewage, with a view to driving out the contained air and recharging the siphon. 75

A is a receiving-well for the collection of sewage, into which the sewers B B discharge.

C is a well at the point to which it is desired to transport the contents of the well A.

D is a siphon connecting the wells A and  
80 C, having its intaking-limb  $d'$  in the well A and its discharging-limb  $d^2$  (which may be protected against the admission of air by a return-bend forming a seal or trap) in the well C, and having the portion of its run  $d$   $d$  85 which is approximately horizontal, but sufficiently inclined to cause the contained air to accumulate at the point where the valve E is placed, at such an elevation that the siphon can be completely filled by submersion when  
90 the flow is arrested and the sewage allowed to accumulate.

E is a valve placed at the crown of the siphon for the escape of air, opening under pressure from within and closing against the  
95 entrance of air from without. It consists of the tube or body  $e$  and the puppet  $e'$ , which when at rest is seated at  $e^2$ .

F is a gate or cut-off valve designed to arrest the action of the siphon when desirable, governed, as shown in the drawings, by the  
100 wheel G.



The operation of my invention is as follows: To charge the siphon, it is only necessary to allow sewage to accumulate in the wells A C until it has risen to an elevation corresponding with the inner top of the siphon D at its highest point. The rising sewage drives out through the valve E the air which collects at the crown of the siphon, and when all of the contained air has been expelled the siphon is ready for operation. The sewage is then removed from well C by pumping or otherwise, as the details of its ultimate disposal provides, and as soon as its level in this well begins to fall the water from well A will begin to flow toward it, and when the water in well C is reduced to its minimum level the sewage will flow from well A at its maximum velocity. If the removal of sewage from well C continues, the flow will continue until the entire contents of well A have been carried to well C or until sufficient air has accumulated in the siphon D to interfere with its proper action. In the latter case it is only necessary to allow the sewage to accumulate until the siphon is again submerged and automatically recharged.

Under some conditions it will be desirable to use two or more siphons arranged in series, the well receiving the discharge of one siphon serving also for the collection of sewage from its surrounding district and being in turn emptied by another siphon discharging into a third well, and thus through the series.

In sewerage a large area it will often be found desirable to construct a number of siphons or series of siphons discharging into a common well. The removal of sewage from this well will induce a flow through all of the charged siphons delivering into it, and thus a large and far-reaching system of siphons can be controlled from a central point.

It will sometimes be desirable to expel the air from a single siphon without interrupting the action of other siphons of a series. To this end each siphon may be furnished with a gate, as shown at F, or other means of closure by which its discharge may be arrested until sewage accumulates sufficiently to fill it and drive out the air accumulated therein. Such gate may be opened and closed by hand,

as at G, or it may be connected with a central station, so as to be operated from thence, as by an electric motor or water-motor.

During the hours of slight flow, as at night, the pumping or other means of discharge may be reduced to the lowest amount that will prevent sewage from rising high enough to interfere with the operation of house-drains, the small amount of flow at this time passing through the siphon at a very low head. While such continued use of a siphon might lead to an objectionable deposit of sediment, the deposit forming in the pipe or in the bottoms of the wells in a single night would be slight. The flushing of the siphons would be effected whenever desired by working the pumps or other means of discharge for a short time at the full capacity, causing such a rapid flow through the siphons and such a disturbance at the bottoms of the wells as to stir up and remove all deposits.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a system of sewerage, the combination of two wells or receptacles as shown, with the siphon and inlets as shown, the siphon having an approximately horizontal run located below the level of the inlet-pipes to one of the wells, substantially as shown.

2. In a system of sewerage, a siphon having its inlet and outlet normally sealed, being substantially horizontal but with sufficient rise toward its discharging end for the accumulation of air, and having suitable appliances for the extraction of accumulated air, substantially as described.

3. In a system of sewerage, a siphon, having its inlet and outlet normally sealed, and with the highest point of its course below the level to which accumulating water or sewage may be allowed to rise in the wells or chambers which it drains, in combination with suitable appliances for the escape of accumulated air, substantially as described.

GEO. E. WARING, JR.

Witnesses:

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G. EVERETT HILL.