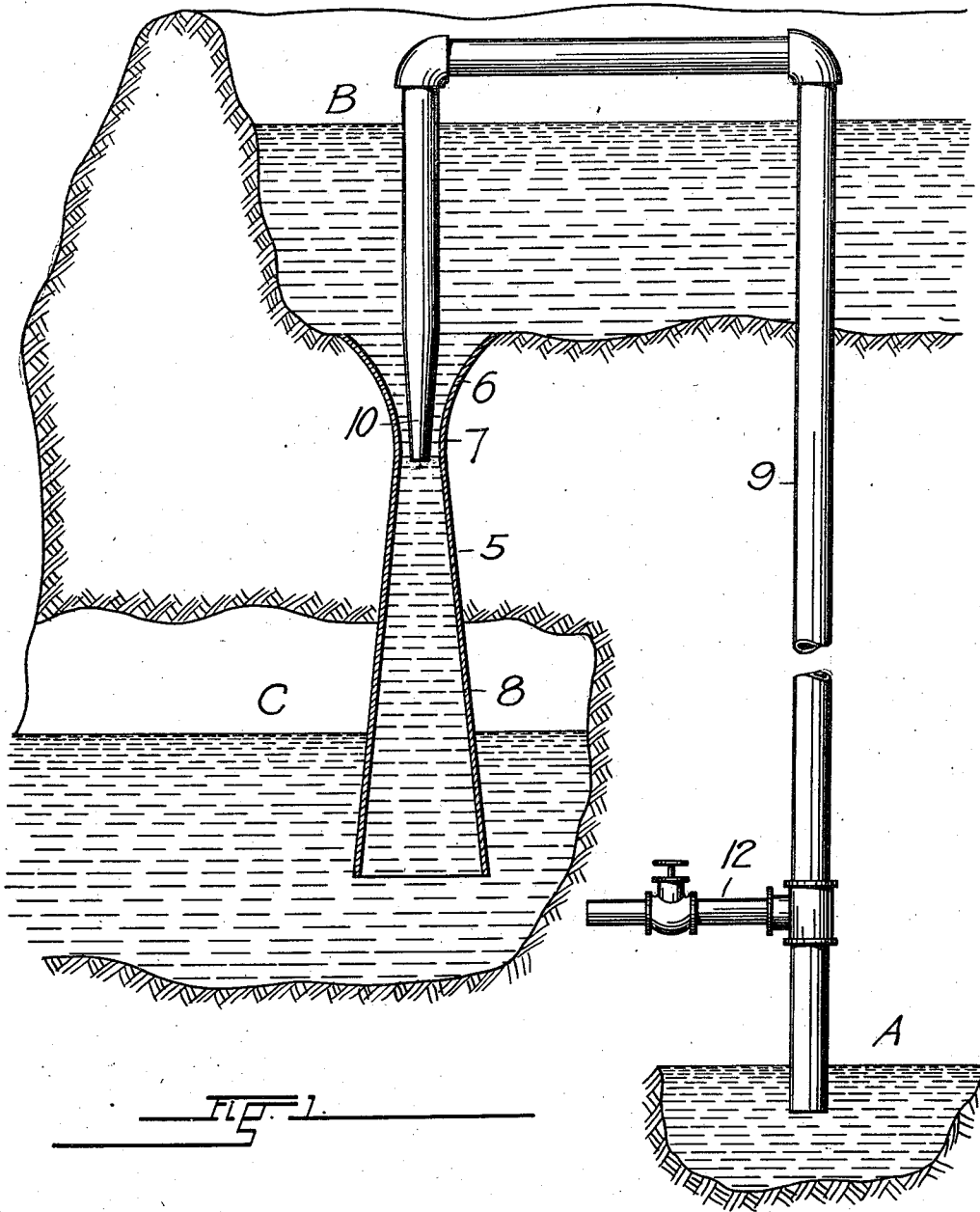


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WATER ELEVATING APPARATUS.  
APPLICATION FILED JUNE 23, 1909.

1,000,345.

Patented Aug. 8, 1911.

2 SHEETS—SHEET 1.



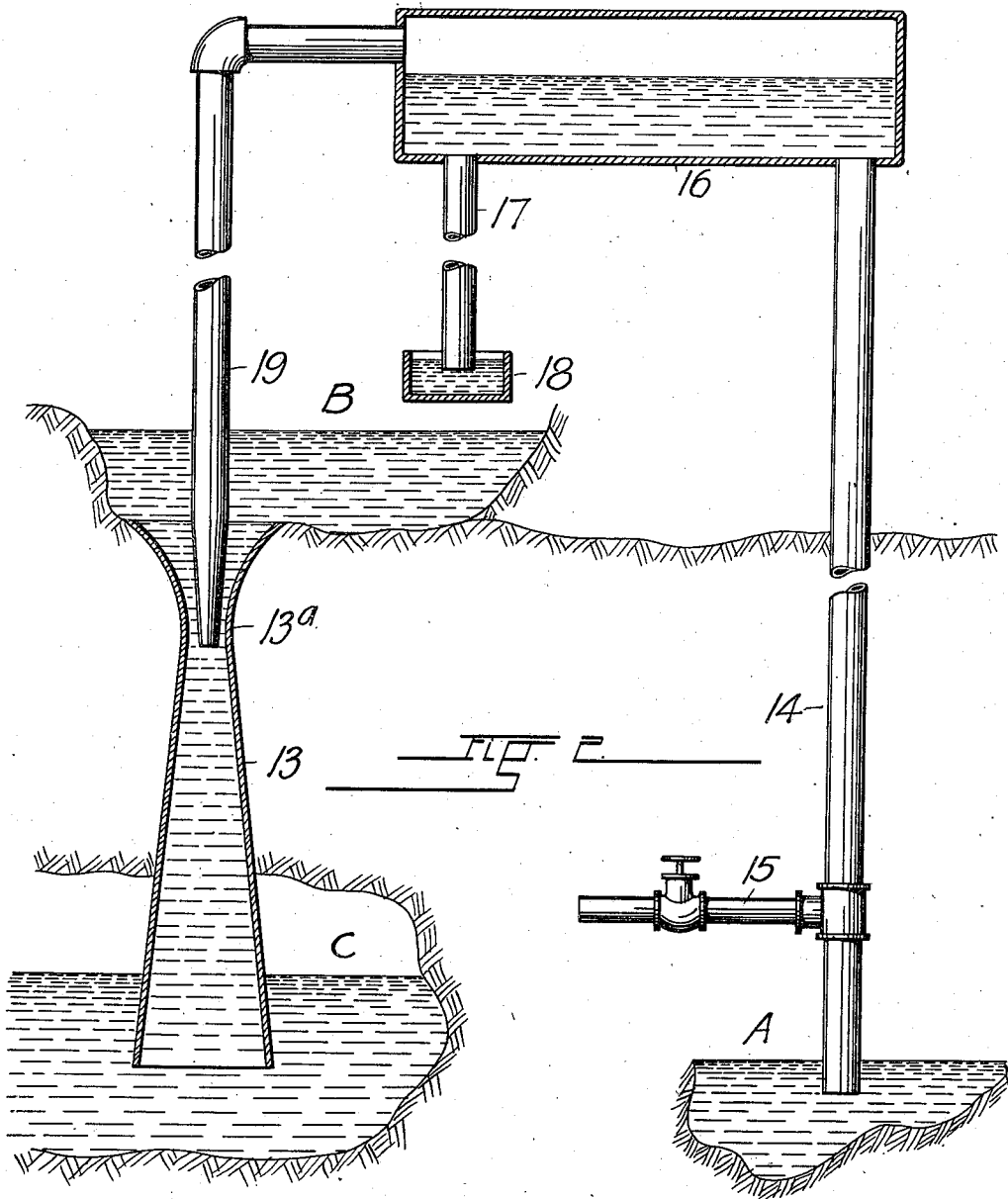
WITNESSES:  
F. H. Cuno.  
M. L. Gray.

INVENTOR.  
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ATTORNEY.

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F. H. Cuno.  
M. S. Geary.

INVENTOR.  
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# UNITED STATES PATENT OFFICE.

OLAF A. ROED, OF DENVER, COLORADO, ASSIGNOR OF ONE-HALF TO CHARLES P. DEATHERAGE, OF KANSAS CITY, MISSOURI.

## WATER-ELEVATING APPARATUS.

1,000,345.

Specification of Letters Patent.

Patented Aug. 8, 1911.

Application filed June 23, 1909. Serial No. 503,927.

*To all whom it may concern:*

Be it known that I, OLAF A. ROED, citizen of the United States of America, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Water-Elevating Apparatus, of which the following is a specification.

This invention relates to improvements in draining apparatus and the object of the invention resides in the provision of an association of simple, automatically operating devices which operate by utilization of the power developed by a body of water falling through a comparatively small distance, to elevate fluid from a lower to a higher elevation.

My invention is based upon the well known fact that the velocities of fluid flowing through a tube of varying diameter, are inversely proportionate to the area of cross section of said tube and that the pressure exerted upon said fluid will vary inversely with relation to the squares of the different velocities attained.

In the practice of my invention, I employ, in combination, a tube composed of axially alined sections connected by a constricted portion or throat, and a conduit one extremity of which extends in the fluid to be raised and which terminates at its opposite end within the tube in proximity to the point of constriction. The ingress section of the tube which contracts to a small diameter, communicates with the higher portion of a stream while the egress section which expands gradually from the constricted extremity of the upper section, projects into the fluid at a point of lower elevation and the conduit which, as mentioned above, terminates within said tube may be provided near its opposite lower extremity, with an air inlet for the purpose of increasing, by aeration, the buoyancy of the transported fluid so as to cause it to rise to a higher elevation. By reason of the peculiar construction of the tube as hereinabove described, the fluid flowing into the contracted ingress portion obeying a well known law of hydraulics, will increase in velocity as it approaches the constricted throat and if the area at the throat is sufficiently reduced will cause the formation of a vacuum at the point where the fluid flows into the expanded egress section. As the conduit through

which the fluid is drained, terminates at the point where the vacuum is formed, a suction is created which draws the fluid from its source, through the conduit, into the expanded portion of the tube to be carried away with the water flowing there-through, this suction being caused by the unbalancing of atmospheric pressure at the throat-section mainly due to the pilot tube effect produced by the rapid flow of fluid past the orifice of the conduit. The total suction thus obtained is sufficiently efficient to elevate water from a low source to a point of higher elevation and, although the invention may be employed for various purposes, it is particularly adapted for draining off the sewage from the subterranean pipe lines in municipalities where the stream to which said sewage is to be conveyed, is above said lines.

An embodiment of my invention is shown in the accompanying drawings in the various views of which like parts are similarly designated and in which—

Figure 1, represents a sectional view of the elements comprised in my invention, in operative position, and Fig. 2, a similar view showing a modified arrangement of the parts.

Referring to the drawings, let the reference character A designate a source of fluid to be drained, B the point of higher elevation of a stream, and C a point of lower elevation of the same.

The tube through the instrumentality of which the vacuum required in the operation of the device, is produced by the flow of water from the portion B to the point C, is designated by the numeral 5, and comprises the trumpet shaped ingress section 6 which terminates in the constricted throat 7, and the therewith axially alined egress portion 8, whose cross sectional area increases gradually from the point of constriction to the lower extremity of the tube which is disposed below the level of the water in the portion C of the stream.

To render the device most effective, the diameter of the tube at its constriction should be very small and the egress portion of the tube should be expanded from the said constriction toward its extremity at an approximate ratio of not less than 1 to 6 and more if possible.

The receiving leg of the preferably siphon

like conduit 9 extends into the source A while its opposite leg has a slightly contracted nozzle 10 which projects, axially, into the egress portion of the tube and terminates at the point of constriction. An air inlet 12 at the lower portion of the receiving leg of the tube provides means for the aeration of the ascending column of water should the vacuum in the tube be insufficient to raise it to the desired height.

The arrangement shown in Fig. 2, operating on the same principle as that hereinbefore described, is especially adapted to lift fluid to a point above the highest water level of the stream from which the power is derived. The tube 13 connects, as before, the points of high and low elevation B and C of a stream, and the suction pipe 14 projects with its lower extremity into the source A and is provided with an air-inlet 15. The upper end of the pipe 14 terminates in a closed reservoir 16 from whose lower portion a conduit 17 leads to the receptacle 18 into which the fluid drawn from the source, is discharged. A conduit 19 connected with the air space of the reservoir 16, projects with its opposite end, into the tube 13 and terminates at the point of constriction 13<sup>a</sup>. The vacuum produced at this point will cause the air to be exhausted from the reservoir with the result that the fluid contained in the source A will rise in the suction pipe, impelled by the atmospheric pressure and the buoyant effect of the air introduced into the conduit through the inlet 15.

It will be understood that if so desired, the conduit instead of extending into a source of fluid supply, may terminate in a reservoir whereby the apparatus may be employed in the capacity of a vacuum pump and that the tube although shown in the drawings in a vertical position, may be placed horizontally or at any desired angle should circumstances forbid its being placed perpendicularly.

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

1. An apparatus for elevating water comprising in combination, a tube composed of two sections, which taper continuously in opposite directions and are connected at their narrow ends by a constricted throat, said sections having their opposite ends, respectively, below the levels of two bodies of water of different elevations, and a reversed siphon one leg of which terminates within the constricted throat of said tube while its

opposite leg extends into a source of water supply of lower elevation than the lower one of the first named bodies of water.

2. An apparatus for elevating water comprising in combination, a tube composed of two sections tapering continuously in opposite directions and connected at their narrow ends by a constricted throat, said sections having their opposite ends, respectively, below the levels of two bodies of water of different elevations, and a reversed siphon one leg of which terminates within the constricted throat of said tube while its opposite leg has an air inlet in its lower portion and extends into a source of water supply of lower elevation than the lower one of the first mentioned bodies of water.

3. An apparatus for elevating water comprising in combination, a tube composed of two sections tapering continuously in opposite directions and connected at their narrow ends by a constricted throat, said sections having their opposite ends, respectively, below the levels of two bodies of water of different elevations, a reservoir having a water-outlet, a suction pipe connected with said reservoir and extending into a source of water supply of lower elevation than the lower one of the first mentioned bodies of water, and a conduit, one end of which connects with the air-space of said reservoir, while its opposite end terminates within the constricted throat of said tube.

4. An apparatus for elevating water comprising in combination, a tube composed of two sections tapering continuously in opposite directions and connected at their narrow ends by a constricted throat, said sections having their opposite ends, respectively, below the levels of two bodies of water of different elevations, a reservoir having a water outlet, a suction pipe connected with said reservoir and extending into a source of water supply of lower elevation than the lower one of the first mentioned bodies of water, and a conduit, one end of which connects with the air space of said reservoir while its opposite end terminates within the constricted throat of said tube, said suction pipe having an air inlet in its lower portion.

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

OLAF A. ROED.

Witnesses:

G. J. ROLLANDET,  
M. L. GEARY.