(No Model.) 2 Sheets—Sheet 1.

R. THAYER.

AUTOMATIC CUT-OFF FOR PUMPS, &c.

No. 548,097. Patented Oct. 15, 1895.

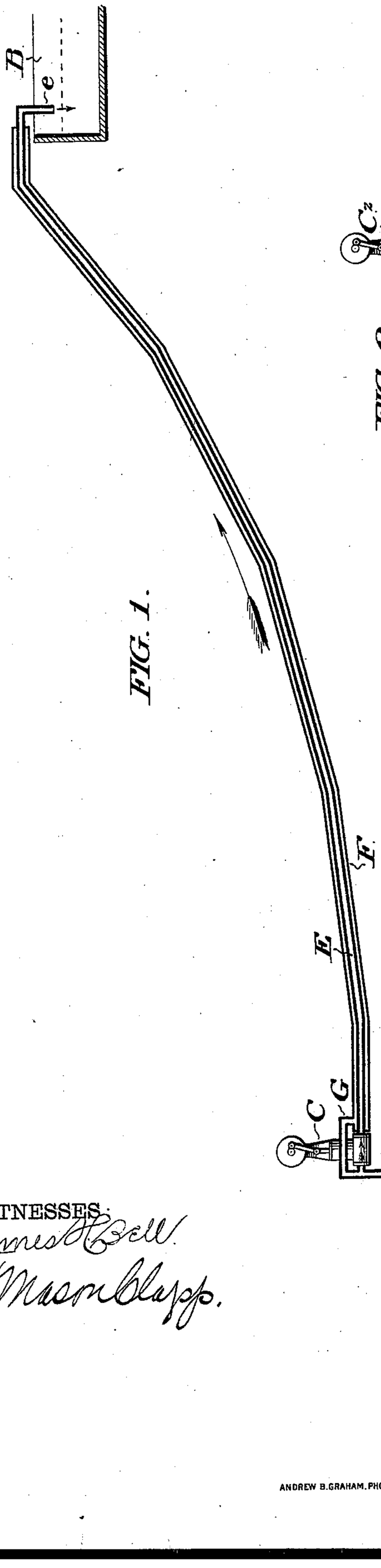

FIG. 1.

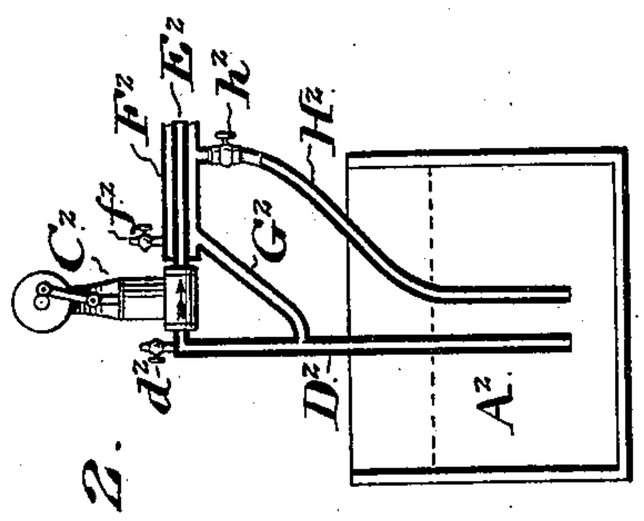

FIG. 2.

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(No Model.) 2 Sheets—Sheet 2.

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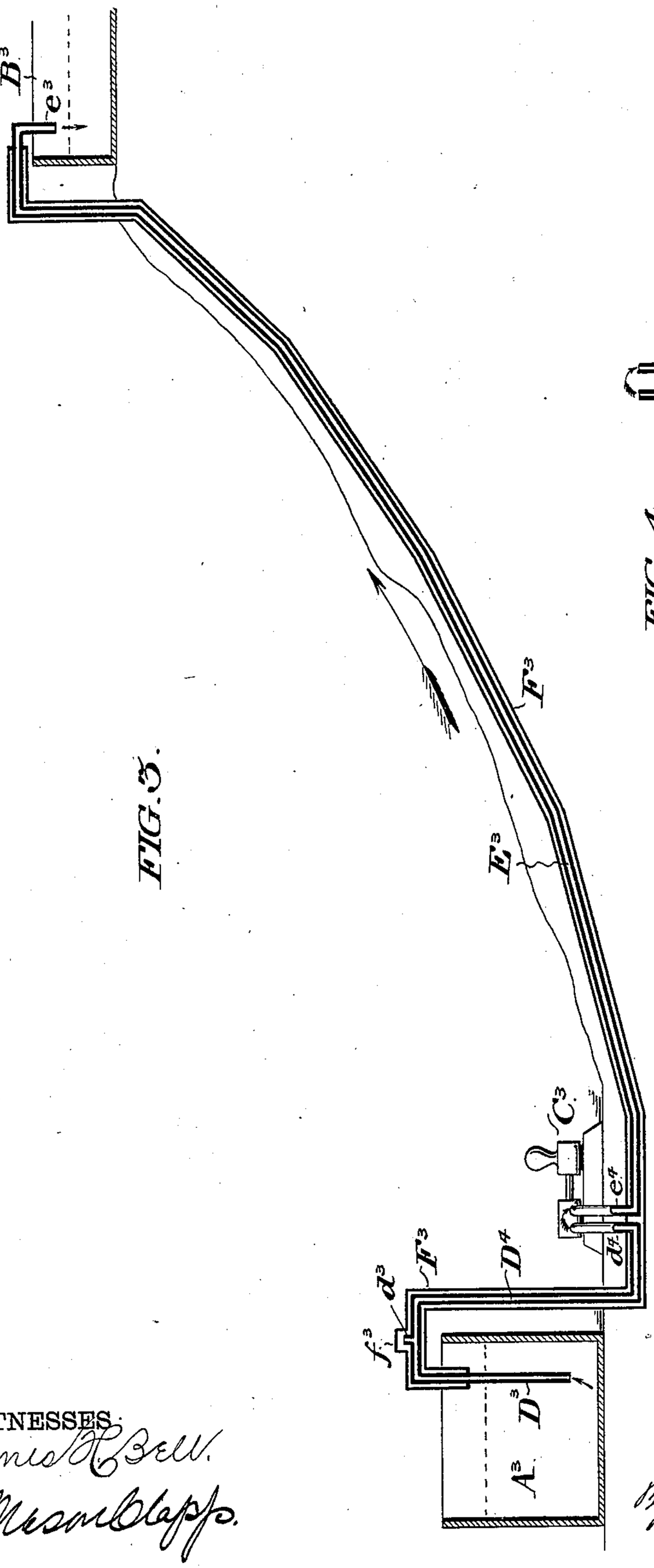

FIG. 3.

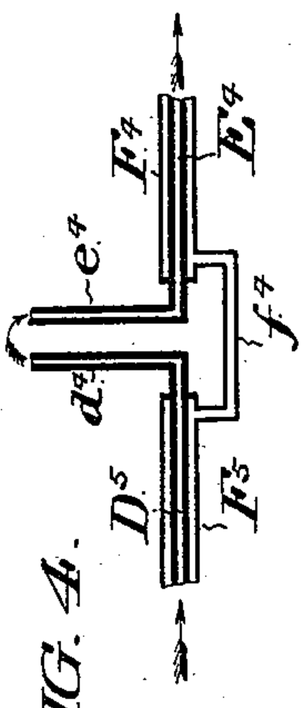

FIG. 4.

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UNITED STATES PATENT OFFICE.

RUSSELL THAYER, OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC CUT-OFF FOR PUMPS, &c.

SPECIFICATION forming part of Letters Patent No. 548,097, dated October 15, 1895.

Application filed March 9, 1894. Serial No. 502,965. (No model.)

To all whom it may concern:

Be it known that I, RUSSELL THAYER, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Automatic Cut-Offs for Pumps and Similar Devices, whereof the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to provide means whereby upon the occurrence of a leak at any dangerous point in the system the flow of fluid shall be cut off.

In my Letters Patent of the United States No. 523,418, dated July 24, 1894, I have specified and claimed an apparatus for a similar purpose to be used in connection with siphons.

The object of my present invention is to extend the principle of operation to cases where, either in connection with a siphon or independent thereof, a positive pumping device is employed.

In the accompanying drawings I have illustrated diagrammatically and without elaboration of detail several convenient types of my apparatus, which will now be described.

Figure 1 represents the device as used in connection with a pump which is both a suction and force pump. Fig. 2 represents another arrangement adapted for use in connection with the same kind of pump. Fig. 3 represents the device as applied to a pumping system where a force-pump is used whose feed is maintained by means of a siphon. Fig. 4 is a partial view representing a convenient variation of construction from the device indicated in Fig. 3.

Referring to the type shown in Fig. 1, A represents a receptacle from which fluid is to be pumped to a second receptacle B. C represents the pump, whose inlet is represented as a pipe D and whose delivery-pipe is represented at E, the nozzle of the latter *e* being in communication with the receptacle B. The delivery-pipe E is inclosed by a tight casing F, a small air-space being left between the exterior of the pipe and the interior of the casing. The casing F may terminate at the delivery side of the pump C. From a point in the inlet-pipe D, between the pump C and the receptacle A and preferably above the maximum level of the liquid in the latter, a pipe G leads to the interior of the casing. This pipe is preferably so disposed that at some point it is above the highest portion of the inlet-pipe D, for a reason which will hereinafter be described.

The operation of the device is as follows: The pump C being actuated, the first effect is to cause a partial vacuum within the casing F. This action continues until the preponderance of external atmospheric pressure causes the fluid in the receptacle A to rise through the pipe D and reach the pump, whereupon the pumping action proper continues in the ordinary manner, the fluid being forced through the delivery-pipe E to the receptacle B. If now a leak occurs at any point in the casing F, admitting the atmosphere to the space between said casing and the pipe E, equilibrium of pressure will at once occur throughout the whole of the casing F, and as the inlet-pipe D communicates therewith through the pipe G the air-leak will be transferred, so to speak, from the delivery side of the pump to the inlet side of the pump and the fluid will no longer be raised by suction.

The purpose of arranging the pipe G so that at some point it is above the highest portion of the inlet-pipe D, is as follows: If the pump C is stopped before the contents of the receptacle A are exhausted, the difference in pressure between the interior of the casing and the outside atmosphere would of course maintain the column of fluid in the pipe D, and if the pipe G were wholly at a level below the pump fluid might be thus forced into the casing, and where parts of the latter were at a sufficiently low level a disadvantageous leakage of fluid into the casing might ensue. This, of course, is avoided by the arrangement shown, since the partial vacuum, produced by the suction of the pump, will in practice not occasion a preponderance of outside pressure to a greater degree than is required for raising the fluid to the level of the pump, and hence when the pump stops the fluid will not rise so as to flow over through the pipe G into the casing.

In the arrangement shown in Fig. 2 all the parts just described in connection with Fig. 1 remain the same, except that the pipe G^2, which corresponds in general purpose with the pipe G, is located below the pump. Un-

der these circumstances the rise of fluid into the casing F^2 would occur when the pump was stopped, unless provision be made for overcoming the preponderance of atmospheric pressure. This may be accomplished by admitting air to the interior of the casing at any point, as by means of a cock f^2, or by admitting air to the inlet-pipe D^2, as by means of the cock d^2, or obviously by closing the inlet-pipe D^2 at a point below the connection with the pipe G^2. These adjunctive devices, however, are not of the essence of the invention proper and in many cases need not be employed even when the apparatus is arranged in the general manner shown in Fig. 2, for the leakage into the casing may be inconsiderable and in no way affect the operation of the device.

Another convenient adjunctive device, as shown in Fig. 2, consists in a pipe H^2, leading from the lowest portion of the interior of the casing F^2 back into the receptacle A^2, or other convenient point. The purpose of this is as follows: If a leak should occur in the inside pipe E^2, fluid escaping therefrom into the interior of the casing might possibly seal the latter, so as to prevent the transfer of the air-leak in the manner described. If, however, the lowest point of the casing be provided with a drain-pipe, as H^2, any such leakage of fluid will be conducted back into the receptacle A^2, or such other point as may be desired, so that the apparatus cannot thus be sealed. The drain-pipe H^2 may be provided with a cock h^2, if desired. I do not, however, deem it necessary to describe any of these adjuncts at great length, since they are not essential to the invention as such.

In the type of apparatus shown in Fig. 3 A^3 represents the receptacle from which fluid is to be pumped into the receptacle B^3. C^3 represents the pump, E^3 the delivery-pipe thereof, and D^3 D^4 the two arms of a siphon, whereby the pump is fed. The casing F^3 is shown as continuous throughout substantially the entire length of the delivery-pipe E^3 and throughout substantially the whole length of the siphon D^3 D^4. The siphon D^3 D^4 is provided at some point above the level of equilibrium of the fluid in its two arms with an orifice d^3, an offset f^3 being formed in the casing at this point, as shown. The whole interior of the casing is therefore in atmospheric communication with the orifice d^3, and if a leak occurs at any point in the casing the air-leak will be transferred to the point d^3 and will break the flow through the siphon, cutting off the supply to the pump C^3.

In Fig. 4 I have illustrated, on a larger scale, another method of constructing the casing at points adjacent to the pump. Thus instead of carrying the casing as a whole past the two immediate inlet and outlet pipes d^4 e^4 of the pump I terminate the casing proper F^4 on one side of the pump and provide a second casing F^5 upon the other side, terminating at a similar point, and establish communication between said two casings by means of a branch pipe f^4. The expedient thus indicated at the particular point in question may obviously be made available at other points, since there may be portions of the pipe system which it is not necessary to guard, owing to the fact that a leak at such points could be detected immediately and other means taken to guard against it. Hence it is not essential for the purposes of my invention that the entire delivery-pipe system of the pump should be provided with a casing, and when in my claim hereinafter made I refer to the casing as surrounding the pipe I do not limit myself to the complete inclosure thereof throughout the entire length, but mean to include devices wherein only desired portions of the pipe are thus inclosed. I also wish it to be understood that I use the term "pump" as synonymous with any positively-acting mechanical device for maintaining a flow of fluid.

I am of course aware that the use of castings upon the exterior of pipes to protect them is not new, and I am also aware that it is not new to insert within an open delivery-pipe an inner pipe adapted to maintain a separate circulation of a fluid of different temperature from that which is intended to be conveyed through the exterior or delivery-pipe proper. I do not claim such devices, it being of the essence of my invention that the casing which surrounds the delivery-pipe should be closed except at the point where it communicates with the inlet side of the pump, in order that a partial vacuum may be maintained within said casing during the pumping operation. Hence the casing thus communicating with the inlet side of the pump and closed during operation at all other points may be properly designated as forming a vacuum-jacket about the delivery-pipe.

Having thus described my invention, I claim—

The combination, with a pump having an inlet and a delivery pipe; of a closed casing surrounding said delivery pipe and communicating with the interior of the inlet whereby a vacuum jacket is formed about the delivery pipe, substantially as described.

RUSSELL THAYER.

Witnesses:
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