(No Model.) 2 Sheets—Sheet 1.

A. BALOCHE & A. KRAHNASS.

HYDRAULIC SIPHON MOTOR.

No. 317,074. Patented May 5, 1885.

FIG. I.

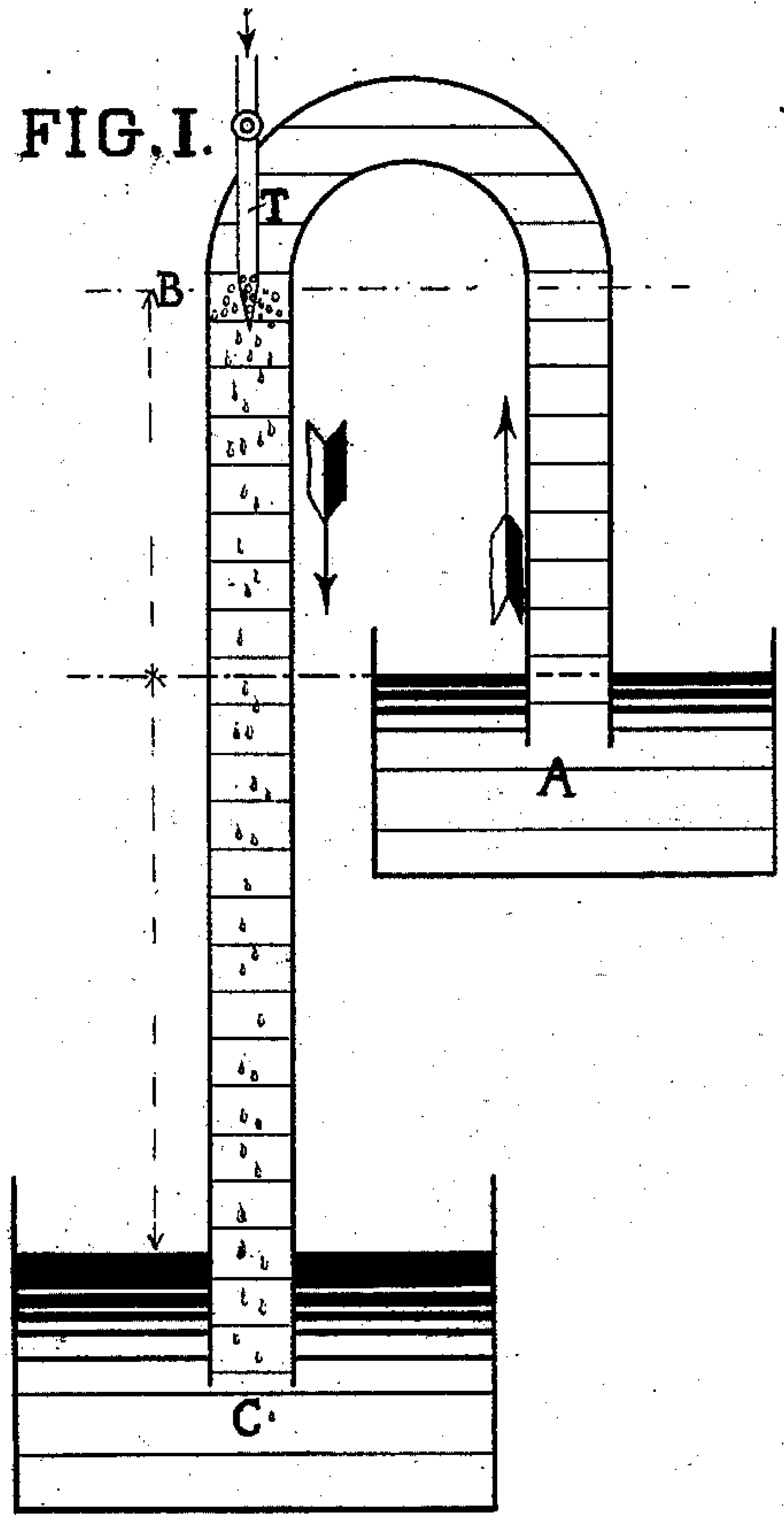


FIG. 2

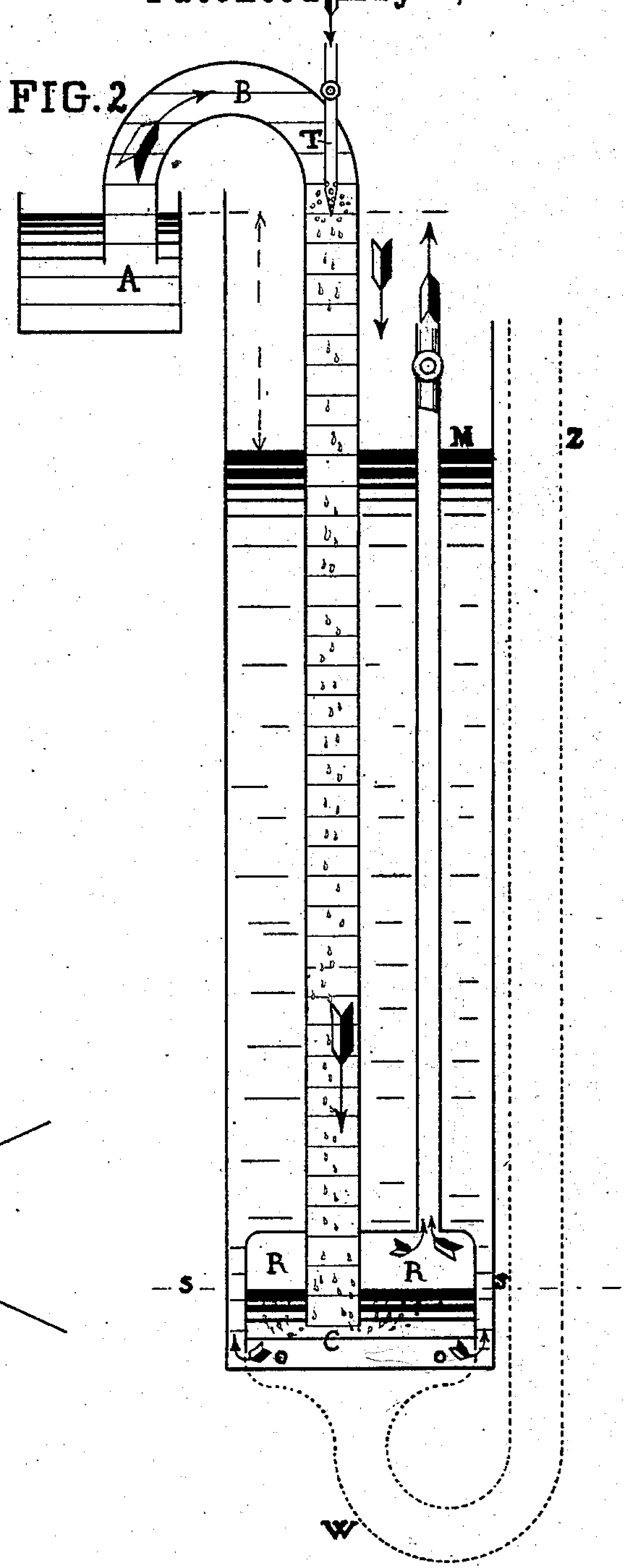
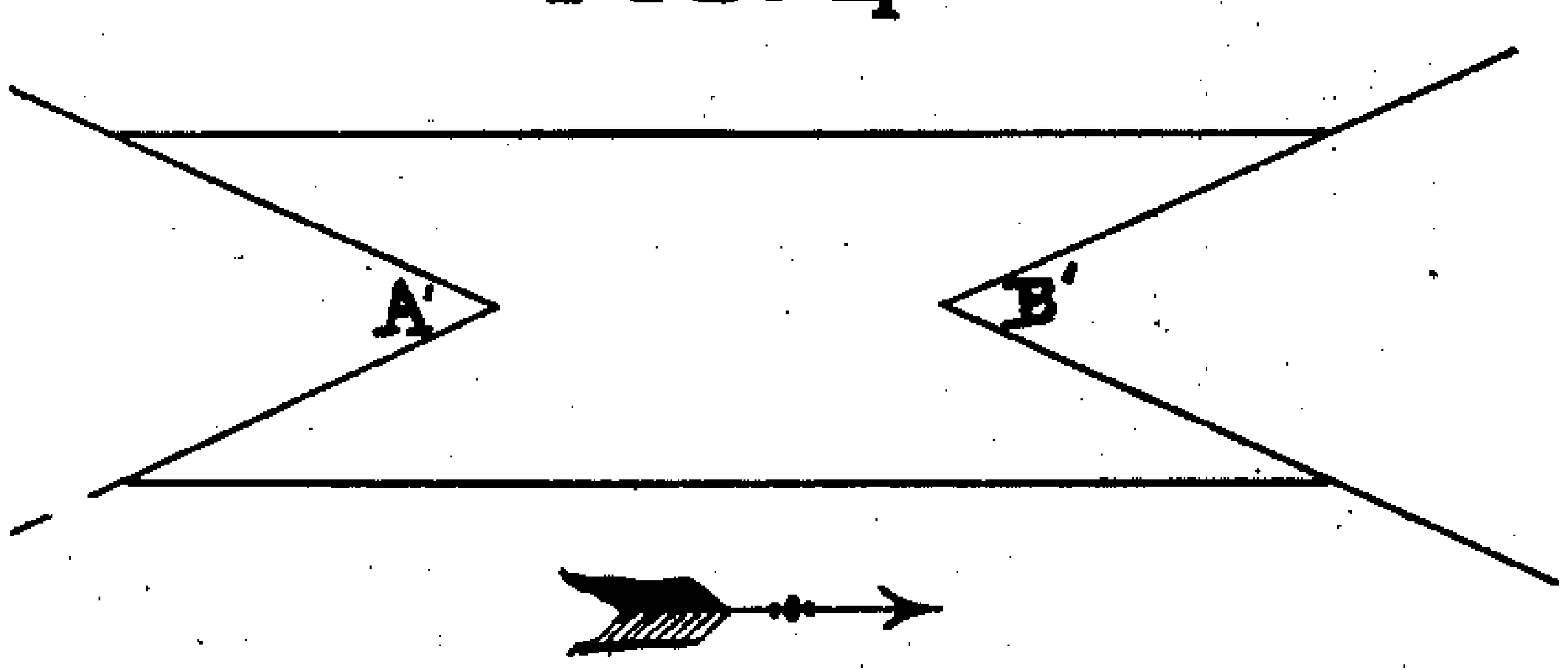


FIG. 4



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(No Model.) 2 Sheets—Sheet 2.

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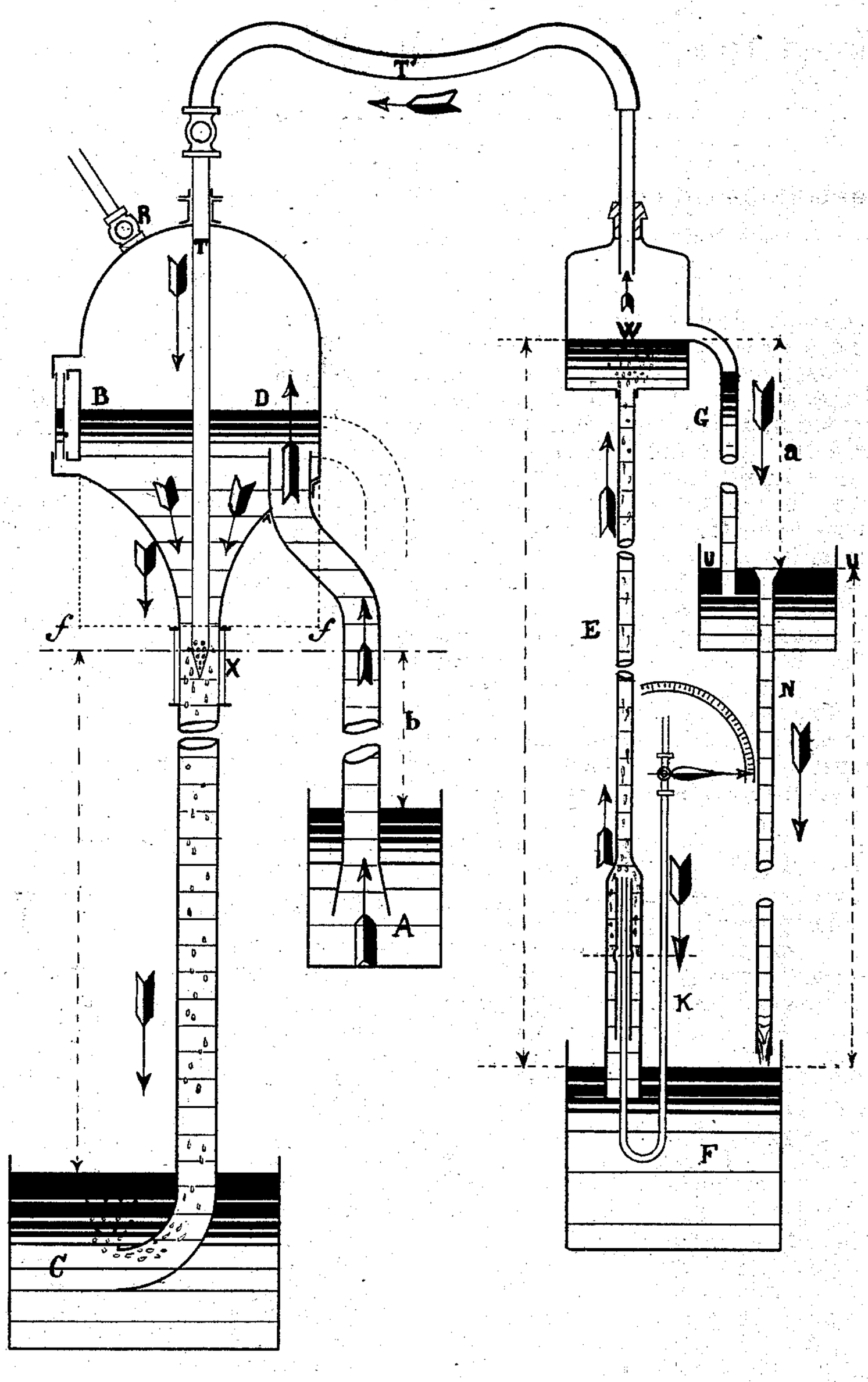
FIG. 3.



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UNITED STATES PATENT OFFICE.

ARSÈNE BALOCHE AND ALFRED KRAHNASS, OF VALPARAISO, CHILI.

HYDRAULIC SIPHON-MOTOR.

SPECIFICATION forming part of Letters Patent No. 317,074, dated May 5, 1885.

Application filed September 20, 1884. (No model.) Patented in France March 7, 1884, No. 160,793; in Belgium March 13, 1884, and in England March 15, 1884, No. 4,949.

To all whom it may concern:

Be it known that we, ARSÈNE BALOCHE and ALFRED KRAHNASS, citizens of France, residing at Valparaiso, in the Republic of Chili, have invented new and useful improvements in a hydraulic siphon-motor acting by the mixture of a liquid and a gas without movable organs, and its industrial applications, of which the following is a specification.

This invention relates to means for utilizing or translating the energy of a current of water or other liquid through the intermediary of air or gas, which is exhausted or compressed by the direct action of the liquid without the aid of movable valves such as used in ordinary pumps.

The rarefied or condensed air may be used for various purposes in apparatus having movable valves, as well as in those which have not.

Figure 1 of the accompanying drawings illustrates in vertical section the simplest form of aspirating apparatus. Fig. 2 is a similar view of a compression apparatus. Fig. 3 represents an apparatus for lifting water constructed in accordance with the invention, and Fig. 4 is a diagram showing an arrangement for securing a head in streams having but little fall.

Referring to Fig. 1, the water from the upper reservoir or receptacle, A, is delivered through the siphon B into the lower reservoir or receptacle, C. These reservoirs or receptacles may be artificial or natural basins, (such as wooden or iron vessels, a mill-pond, bed of a stream, and the like.)

In the descending leg of the siphon, near its upper end, at a short distance below the bend, a pipe, T, is inserted. The lower end of the pipe is pointed and provided with numerous perforations. The pipe has a stop-cock, which is opened when it is desired for the apparatus to operate. As soon as the cock is opened air rushes through the pipe T and escapes at the lower end in bubbles, which are carried down with the current, provided this is sufficiently rapid. It will be necessary, of course, always to have such a head and such a proportion of parts that a suitably rapid flow is secured. As the pipe T terminates above the level of the water in reservoir A, the pressure in the siphon at the lower end of said pipe is less than that of the atmosphere, because the downward pressure of the column of water between said end and the level of the liquid in the reservoir A neutralizes a portion of the atmospheric pressure. In consequence of this diminished pressure the air would rush through the pipe T independently of the current in the siphon. This current carries off the inflowing air and prevents it from destroying the action of the siphon.

The pipe T may be connected with a closed chamber, in which case the effect is to exhaust the same of air or other gas contained, and to maintain a certain degree of vacuum therein notwithstanding leakage or evaporations in the chamber. It is evident, also, that pipe T could be connected with any apparatus that utilizes an exhaust. Such an apparatus is shown at the right of Fig. 3, the air being exhausted from the chamber W, as fully described below.

In Fig. 2 the reservoir or receptacle C is deep, and the siphon-leg extends nearly to the bottom. The bubbles of air are therefore carried down nearly to the bottom of said reservoir, and, passing out of the siphon, are collected in bell R. The collected air is maintained under a pressure depending upon the depth of the liquid above said bell, or, more exactly, by the depth of liquid above the level of the liquid in bell R, which level is indicated by the dotted line S S. The compressed air can be taken off by the pipe M, and utilized to drive engines and for other suitable purposes.

The pipe M is provided with a stop-cock to regulate the passage of air through it. The water or other liquid passes out into the reservoir C around the bottom edge of the bell R, as indicated by the arrows. When the fall is small, the reservoir or receptacle C is or may be a well or pool; where great, a close envelope or case should be used, or a simple pipe may be connected with the bottom of the bell, as indicated in dotted lines at W Z. The air-pressure may also be maintained in the bell R without any superincumbent column by providing the bell R at the bottom with an escape-pipe and a stop-cock, so that the outflow of liquid can be checked to the proper extent.

In Fig. 3 the siphon B has a vacuum-chamber, D, at the upper part, and a pipe, R, communicating with said chamber, is provided for withdrawing the air in order to start the flow. The bottom of chamber D presents the form indicated by dotted lines *f f*. The descending leg of the siphon is provided opposite the perforated end of pipe T with a section of glass, X, so that the air-bubbles can be observed. The pipe T is connected by the flexible tube T′ with the water-lifting apparatus at the right of the figure. The pipe T communicates with the vacuum-chamber W of this apparatus. From the bottom of this chamber descends the inlet-pipe E, which is enlarged near the bottom, as shown. The pipe E dips into the reservoir or receptacle F, from which the water is to be raised. The outlet-pipe G, opening into the vacuum-chamber W about halfway up the side thereof, delivers the water into the raised reservoir or receptacle U, the lower end dipping below the surface of liquid therein, so as to be sealed against the ingress of air. The outlet-pipe is of sufficient length to prevent the liquid being drawn through it into the vacuum-chamber, the water standing always below the junction with the vacuum-chamber, as shown in the drawings. To insure this the distance from the top of the outlet-pipe to the level of the liquid in reservoir U, which distance is indicated by the dotted line *a*, should be greater than the distance (represented by dotted line *b*) from the liquid-level in reservoir A to the perforated end of suction-pipe T. The air-pipe K extends up into the enlarged end of the pipe E. The air being withdrawn from the chamber W through the pipes T′ T by the action of the current flowing into reservoir C, a partial vacuum is maintained in said chamber W. This partial vacuum, besides causing the water in the reservoir or receptacle F to rise a certain distance in the pipe E, induces a current of air through the air-pipe K. The bubbles escaping from this air-pipe carry up the water into the vacuum-chamber W, from which it flows through the outlet-pipe G into the reservoir U. An overflow-pipe, N, maintains the level of the liquid in reservoir U. The water descending from the reservoir A through the siphon B into the reservoir C thus effects the lifting of a smaller quantity of water from the reservoir or receptacle F into the reservoir or receptacle U through the pipe E, vacuum-chamber W, and pipe G. The water in the raised reservoir U can be used for any purpose—as, for example, to supply a dwelling with water for drinking, cooking, and washing. The overflow-pipe N simply discharges the excess and prevents the overflowing of the reservoir U.

One use of the whole apparatus would be to enable a fall (from reservoir A to reservoir C) of water which would be unsuited to domestic purposes for any reason—say from its impurity—to lift other and purer water in the reservoir F, which naturally lies at too low a level to be utilized without some form of lifting apparatus. Other uses will readily suggest themselves. The lifting of a column of water through the pipe E can also be effected by the introduction near the base thereof, through the pipe K, of a jet of compressed air, the upper end of the pipe containing the water-column being open to the air. The compressed air for such a jet may be furnished from the apparatus shown in Fig. 2. It may also be remarked that in place of allowing the water to escape continuously from the chamber W, it may be allowed to collect there until the chamber is full, when, the communication with pipe T being cut off and the inlet E being closed by suitable cocks, valves, or clapets, the water can be allowed to run out. The chamber W can then be filled again, as before, and then emptied, and this can be repeated indefinitely. The valves could be operated automatically. In operating in this way the long outlet-pipe G and the reservoir U, with its overflow N, would be dispensed with. Water can also be raised by the simple exhaustion of air from the chamber W, the latter when full, or when filled to the desired height, being emptied by cutting off the connection with pipe T and reservoir F and opening a suitable outlet. When emptied, it can be refilled in like manner and again emptied. These operations can be made to take place automatically by a float controlling valves.

With suitable modifications this same apparatus can be made to serve in cases where the ascending column contains air or gas mixed with the liquid. In such cases it would be necessary to interpose in the tube T or T′ a regulating air-chamber. Siphon apparatus constructed in accordance with the invention is applicable to the cleaning of mud and sand from rivers by means of a tube in which air compressed by a siphon produces an ascending current; also to the purposes of collecting and directing upon a single point the power or energy from two or more siphons at different points upon one or upon different watercourses; also to the cleaning of gutters or sinks, and to the raising of water to great heights by a series of successive stages. Where it is desired to utilize the energy of streams having but little fall, the flow of the stream is made to increase the fall by an arrangement of apparatus such as shown in diagram, Fig. 4. The boat or support to the siphon is at the end pointing upstream, made V-shaped, the flaring base being open to the inflow of the water, as shown at A′. The level is thus made higher at the point of the boat or support. At the stern or downstream end the support is V-shaped, but the flaring end is downstream, as shown at B′. The flow of the current tends to withdraw the water from the V and lower the level therein. The siphon is supplied with water from the point of the hollow bow A′, and delivers the waste water into the point of the hollow stern B′.

Among the uses of the invention may be mentioned aeration, ventilation, drying, transmission of energy, elevation of liquids, transport and elevation of flour and other fine powders by rarefied or compressed air, distillation or evaporation in a partial vacuum without or almost without fire, and without a vacuum-pump, the manufacture of ice, the production of a vacuum for emptying drains or cesspools, and the like.

The dimensions, proportions, and materials, as well as the forms and accessories, may be changed without departing from the spirit of the invention.

We claim—

1. The combination, with the siphon, of the suction-pipe opening into the descending leg of the siphon, substantially as described.

2. The combination, with the siphon and the suction-pipe opening into the descending leg of the siphon, of the bell and accessories for collecting and maintaining the air or gas under pressure, substantially as described.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

ARSÈNE BALOCHE.
ALFRED KRAHNASS.

Witnesses:
GUSTAVE BLIEDERHAEISER,
AUGUST MÖLLER, Jr.