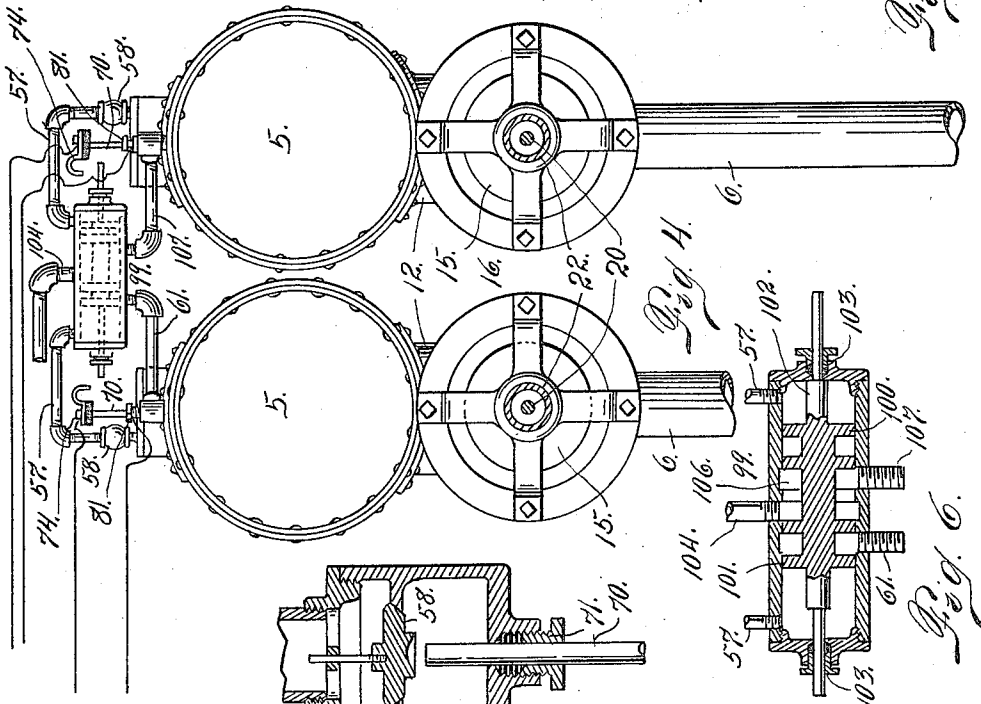
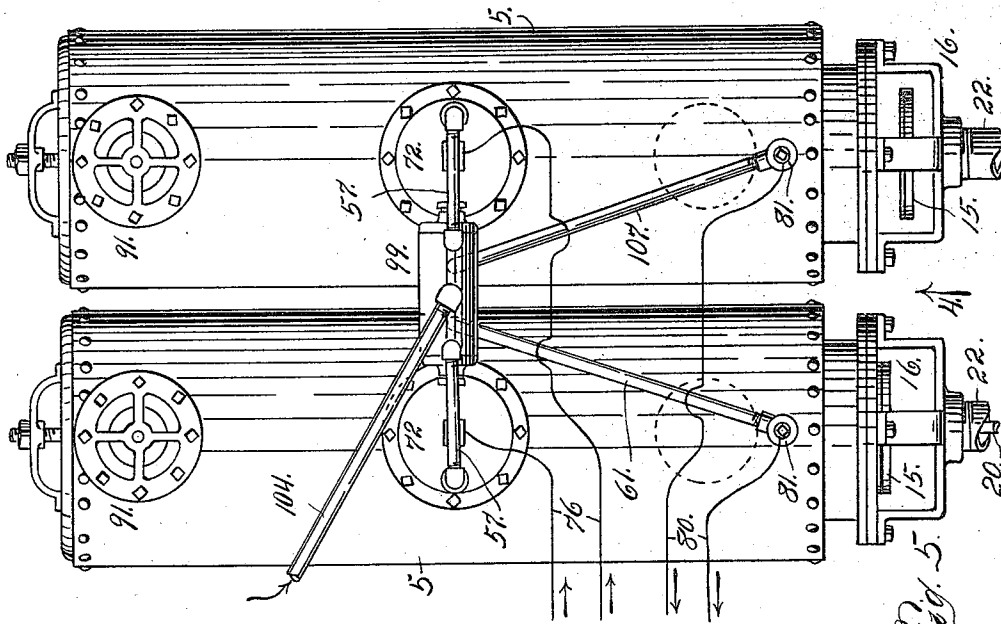


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 AUTOMATIC VACUUM PUMP.
 APPLICATION FILED JULY 21, 1911.

1,069,772.

Patented Aug. 12, 1913.

2 SHEETS-SHEET 2.



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Fig. 3.

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AUTOMATIC VACUUM-PUMP.

1,069,772.

Specification of Letters Patent.

Patented Aug. 12, 1913.

Application filed July 21, 1911. Serial No. 639,727.

To all whom it may concern:

Be it known that I, WILLIAM HENRY DRUMMOND, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Automatic Vacuum-Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in automatic vacuum pumps, my object being to provide an economical construction for lifting water by suction.

In my improved construction, a vacuum or partial vacuum is intermittently produced in a tank by virtue of successive explosions of a suitable mixture, which is automatically drawn into the tank as the water passes out of the same. As the water lowers in the tank, a float moves downwardly therewith and closes a spark plug circuit, whereby a spark is produced in the tank, resulting in an explosion of the charge of explosive mixture, the tank having an outwardly-opening check valve through which the force of the explosion is released and the products of combustion expelled. Immediately after such expulsion, the check valve, as well as the water outlet valve, closes by gravity and the action of the vacuum produced within the tank. This vacuum acts upon the water through a suction pipe communicating with a suitable source of supply, whereby water is again drawn into the tank to a suitable level. As the float rises, a stem connected therewith opens a check valve, whereby communication is established between the upper part of the tank, where a partial vacuum still exists, and a casing in which is located a slide valve, the power of the vacuum serving to shift this valve and open communication between the tank and a carbureter, thus breaking the vacuum in the upper part of the tank and allowing the water to pass out of the tank by gravity.

Attention is called to the fact that, as soon as an explosion occurs in the tank, its

force, acting through a suitable pipe connection with the slide valve casing, serves to shift the slide valve and cut off communication between the carbureter and the tank, thus closing the tank and preventing the breaking of the vacuum through this avenue. The force of the explosion at the same time serves to close the outlet valve.

My present improvement also includes a double or duplex construction whereby two tanks are employed and explosions automatically produced therein alternately. That is to say, while the water is escaping from one tank by virtue of the breaking of the vacuum within the tank, the water is rising in the other tank due to an explosion which has just occurred in the latter. A single slide valve is employed which is alternately shifted by force of the explosion in the two tanks.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing, in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a sectional view taken through my improved apparatus where only one tank is used. Fig. 2 is a section of the slide valve mechanism for controlling the explosive mixture supply to the tank. Fig. 3 is a detail, sectional view of a check valve, forming a part of the mechanism, the parts being shown on a larger scale. Fig. 4 is an end view of the duplex form of construction, the mechanism being double and the two tanks cooperating and acting alternately to perform their various functions. Fig. 5 is a top plan view of the same. Fig. 6 is a sectional view in detail of the double form of slide valve construction employed in connection with the mechanism shown in Figs. 4 and 5.

The same reference characters indicate the same parts in all the views.

Referring first more especially to Figs. 1 to 3, inclusive, let the numeral 5 designate a tank having a suction pipe 6, communicating with a source of water supply 7, this source being located with reference to the tank within the range of the vacuum pull where the apparatus is located. The lower extremity of this pipe is equipped with a strainer 8, carrying a check valve 9 adapted

to open upwardly under the influence of the suction within the pipe and arranged to close by gravity, aided by the force of the explosion within the tank. This suction pipe is equipped with a valve 10 for completely shutting off communication between the pipe 6 and the tank 5 when desired.

Communicating with the lower part of the tank is an elbow-shaped discharge pipe 12, in which is located a partition 13, having an opening 14, the partition forming a seat for the two members 15 of a reciprocating valve which may be designated in its entirety by the numeral 16. These valve members are mounted upon a stem 17, one of whose extremities protrudes into an opening 18 formed in a lug 19 formed integral with the elbow-shaped valve casing; while the opposite extremity 20 of the valve stem is equipped with a stop 21, which is engaged by one extremity of a spiral spring 22, located within a casing 23 and whose opposite extremity is engaged by a follower 24, fixed on one extremity of a tension screw 25, whose opposite extremity is equipped with a hand crank 26 for manually regulating the tension of the said spring.

When it is desired to discharge water into a tank and automatically cut off the water supply when the level of the latter rises in the storage tank to the desired level, the mechanism illustrated at the lower part of Fig. 1 may be employed. Under these conditions, a tank 27 is equipped with a float 28 having a stem 29, whose upper extremity is connected, as shown at 30, with a lever 31, fulcrumed at 32, the opposite extremity of the lever being connected, as shown at 33, with one extremity of a link 34, whose opposite extremity is connected, as shown at 35, with a lever 36, fulcrumed at 37, the opposite extremity 38 of the lever being arranged to act upon a pin 39 passing through an opening 40 formed in the lug 19 at right angles to the opening 18, adapted to receive the stem 17 of the valve 16.

When the apparatus is in operation and the water 41 rises within the tank 27 to a predetermined level, the upward movement of the float will act upon the levers 31 and 36 through the instrumentality of the connections just described to cause the pin 39 to intersect the passage 18 and lock the valve 16 in the closed position when the said valve is closed by movement toward the right. This will prevent the escape of the water from the tank 5, whereby the latter will remain primed and ready to commence operating as soon as the float 28 falls within the tank 27, whereby the lever mechanism is reversed and the stop pin caused to move downwardly out of the path of the valve stem 17. In this event, the action of the spring 22 upon the valve 16 will help move the said valve toward the left and

open the same, whereby the water begins to escape from the tank 5 into the tank 27, as hereinafter more fully explained.

Mounted in suitable proximity to the tank is a slide valve 42 composed of a casing 43, and separated disks 44 and 45, mounted upon a stem 46. The opposite extremities 47 and 48 of this valve protrude through stuffing boxes 49 and 50, with which the opposite heads of the valve casing are equipped. This valve mechanism is further provided with a disk 51. The two valve disks 44 and 45 are suitably separated. A pipe 52 communicates with the chamber of the slide valve at one extremity, and with a carbureter 53 at its opposite extremity, said carbureter being connected by means of a pipe 54 with a gasolene tank 55, the pipe 54 being equipped with a cut-off valve 56. A pipe 57 is also connected with the chamber of the valve 42 at one extremity, the opposite extremity being connected with an outwardly-opening check valve 58, with which is also connected one end of a pipe 59, whose opposite extremity is in communication with the upper part of the tank 5, as shown at 60. A pipe 61 is also connected at one extremity with the chamber of the valve 42, the opposite extremity of this pipe being in communication with the upper part of the tank 5 by means of a short inlet pipe 62 connected with the pipe 61 by a T-fitting 63 in which is also located a spark plug 64 of the usual or any suitable construction.

Within the tank 5 is located a float 65, having a stem 66 pivoted as shown at 67 upon a stationary support 68, the said stem being connected intermediate its extremities, as shown at 69, with a vertically-disposed stem 70, passing through a stuffing box 71, formed in a plate 72, serving to close a man-hole 73 formed in the top of the tank 5. The upper extremity of the stem 70 is arranged to act upon the check valve 58 to open the latter, as the float rises, whereby communication is established between the upper part of the tank and a chamber of the valve 42, whereby the partial vacuum, still maintained in the upper part of the tank, serves to shift the said valve to open communication between the carbureter and the upper part of the tank, as hereinafter more fully explained. The stem 71 carries at its upper extremity a metal contact 74, which is insulated from the stem by a piece of fiber 75, or other suitable insulating material. From this contact leads an electrical conductor 76 to one terminal 78 of the secondary or induction member of a spark coil 77, from whose opposite terminal 79 leads a conductor 80 to the spark plug 81. From one pole 82 of a battery 83 leads a wire 84 to one terminal 85 of the primary member of the spark coil 77; while, from the op-

posite terminal 86 of this coil, a wire 87 leads to the opposite pole 88 of the battery, a switch arm 89 being interposed between the two parts of the wire 87 to permit the making and breaking of the circuit at will.

At one extremity of the tank 5, the latter is equipped with a check valve 90, located within a casing 91 and adapted to engage a seat 92 for closing a passage 93 communicating with the tank 5. This valve is provided with a stem 94, passing through a guide 95 extending across the top of the open valve casing 91.

From the foregoing description, the use and operation of my improved automatic vacuum pump, so far as thus described, will be readily understood.

In order to start the pump, it is necessary to prime the latter by supplying it with a suitable quantity of water through an opening 96 normally closed by a screw-plug 97. Before introducing this water for priming purposes, the valve 16 is closed by manually operating the tension screw 25, whereby the valve 16 is shifted toward the left and its right hand member 15,—see Fig. 1,—caused to engage the valve seat 13. As soon as the tank has been supplied with the necessary water for priming purposes, the valve 16 is allowed to open by a movement toward the right, the tension screw 25 being actuated to release the tension of the spring 22. As soon as this valve is opened, the water will escape from the tank 5 through the opening 14 and pass into the tank 27, where the pump is operated for the purpose of filling the tank 27, which may be a railway water tank or any other tank where the water has a tendency to fluctuate, my improved pump serving automatically to maintain the water of the tank at a uniform level approximately. As the water escapes from the tank, a charge of explosive mixture is drawn thereinto from the carbureter 53, through a pipe 52, which enters the chamber of the valve mechanism 42 between the disks 44 and 45, it being assumed that the valve mechanism is in the position illustrated in Fig. 1, whereby, as the explosive mixture enters the valve chamber, it passes through the latter into a pipe 61 and thence into the tank through the short branch pipe 62. As soon as the water within the tank is lowered so that the float 65 occupies approximately the position shown by dotted lines in Fig. 1, the contact 74 is brought into engagement with the valve stem extremity 48, whereby the circuit is closed through the spark coil 77, and the spark produced through the instrumentality of the spark plug 64 within the tank, whereby the explosive mixture is caused to explode. This explosion acts immediately to open the check valve 90, whereby the products of combustion are expelled and a vacuum condition

produced within the tank. At the same time, the valve 16 is closed, the force of the explosion shifting the said valve toward the right. Immediately after the explosion, the vacuum condition within the pipe acts in conjunction with the spring 22 to shift the balanced valve 16 toward the left, closing the latter by bringing the righthand disk 15 into engagement with the valve seat. The check valve 90 also immediately closes through the action of gravity and the vacuum within the tank. As the explosion takes place, its force, acting through the pipes 59 and 57, is communicated to the chamber of the valve 42, whereby the valve is shifted toward the right and the valve disk 45 brought into a position between the inlet extremity of the pipe 52 and the outlet extremity of the pipe 61, thus cutting off communication between the carbureter and the tank. Immediately after the force of the explosion has been expended, the check valve 58, under the influence of the produced vacuum and gravity, is closed. There is then a relatively high vacuum condition within the tank, and the water rises by suction from the source of supply 7 through the pipe 6 and enters the tank until the level therein is raised to approximately that indicated by the dotted line 98 in Fig. 1. As soon as this occurs, the float 65 is raised to the full line position in Fig. 1, the stem 70 serving to open the check valve 58, whereby the vacuum condition in the upper part of the tank above the level of the water is communicated to the extremity of the chamber of the valve 42 farther to the left in Fig. 1, resulting in the shifting of the valve disks 44 and 45 toward the left, a sufficient distance to place the passages "52" and "61" in communication with each other, whereby the carbureter is again placed in communication with the tank 5, thus breaking the vacuum in the upper part of the latter. As soon as this occurs, the water begins to escape through the outlet opening 14 into the tank 27, it being assumed that the water level of this tank has not yet risen to the level necessary to stop the operation of the pump through the action of the float 28, as heretofore described.

In the double form of construction, illustrated in Figs. 4 and 5, two tanks 5 are employed, and a slide valve 99,—a slightly modified form of construction,—is used. This slide valve is composed of two valve members 100 and 101, carried by a stem 102, passing through stuffing boxes 103, mounted on the opposite extremities of the valve casing. This casing is connected with the carbureter by a pipe 104, which communicates centrally with the valve chamber. When the valve is in the position shown in Figs. 4 and 6, the charge of explosive mixture passes into the right hand tank 5 by virtue of the

fact that this mixture enters the casing of the valve 99 between the two valve members in space 106, this space being also in communication with a pipe 107 leading to the tank 5 farther to the right. It will be assumed now that the water is escaping from this tank by virtue of the fact that the valve 16, connected therewith, is open. As the water escapes, a charge of explosive mixture is drawn into the tank through the pipe 104, and this operation continues until the float within the said tank member reaches a predetermined low level, when the circuit is closed through a spark coil in the manner heretofore described, and a spark produced within the tank, producing an explosion whose forces serve to produce a vacuum within the tank in the manner heretofore explained. As the water rises in the tank, to fill this vacuum, the float within the tank is also lifted. In this form of construction, however, the stem 70 is not required to operate the check valve 58, since, as soon as the water rises to the predetermined level in one tank, an explosion takes place in the other tank and shifts the valve member 101, whereby communication between the carbureter and the tank farther to the right is opened, and communication between the carbureter and the tank farther to the left closed. Then, as the water is escaping from the tank 5, farther to the right, the water is entering the tank farther to the left, as a result of the vacuum produced in the last-named tank. In this way, the two tanks operate automatically, their corresponding functions being alternately performed.

It may be stated that, whenever the disks 100 and 101 of the valve 99 are shifted in either direction, the stem extremities of the said valve will be shifted so as to throw one of the said extremities out of the path of one electrical contact 74 and into the path of the corresponding electrical contact 74 of the other tank. As the circuit is closed, through the spark coil in the same manner in the duplex as in the single form of construction, it is not thought necessary to describe the duplex form more in detail.

Having thus described my invention, what I claim is:

1. In combination, an explosion chamber in communication with a water source, float-controlled means for causing explosions in said chamber, whereby when the water reaches a predetermined low level the ex-

plosions will occur, a tank to be filled, a water passage leading from the chamber and emptying into the tank, a valve in said passage, a float in said tank and an operative connection between said valve and last named float whereby the valve will be closed when the water in the tank has reached a predetermined high level and the explosions in the chamber will cease.

2. In a water-lift apparatus, an explosion chamber, a horizontally arranged slide valve, a carbureter, a communication between said chamber and carbureter through said slide valve, and a passage from the chamber to the slide valve through which the force of an explosion in the chamber will be transmitted to the valve to shift the same to interrupt communication between the carbureter and chamber and through which a vacuum in the chamber will be made available to shift the valve to establish communication between the carbureter and chamber.

3. In a water-lift apparatus, a chamber, a conduit leading from the chamber to a water source, a horizontally arranged slide valve, a carbureter, a communication between said chamber and carbureter through the slide valve, a passage from the chamber to the slide valve through which the force of an explosion in the chamber will be transmitted to the valve to shift the same to interrupt communication between the chamber and carbureter, and a check valve in said passage adapted to be opened mechanically when the water in the chamber has reached a certain predetermined level whereby a vacuum in the chamber will be made available to shift the valve to establish communication between the carbureter and chamber.

4. In a water-lift apparatus, an explosion chamber in communication with a water supply source, a passage leading from said chamber and emptying into a tank to be filled, a valve seat in said passage, a double valve piece adapted to close the valve when shifted to either extreme position and to open the valve when in the intermediate position, and a resilient means tending to prevent the shifting of the valve piece to one extreme position.

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

WILLIAM HENRY DRUMMOND.

Witnesses:

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CLORA E. BRADEN.