

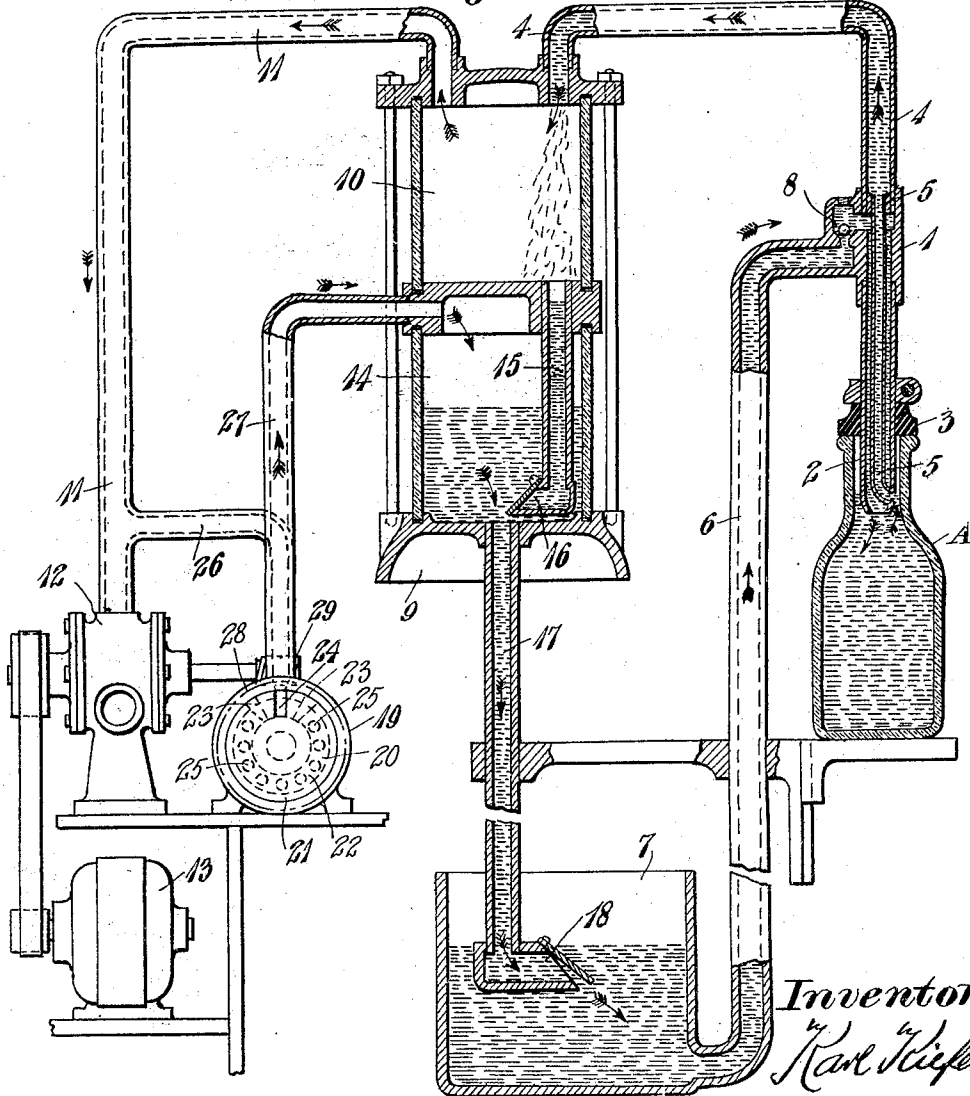
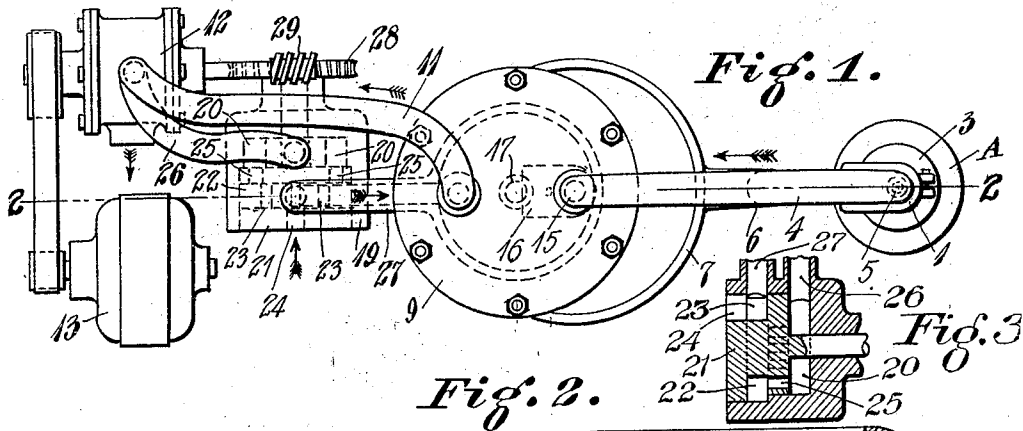
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K. KIEFER

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EVACUATOR

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Inventor
Karl Kiefer

UNITED STATES PATENT OFFICE

KARL KIEFER, OF CINCINNATI, OHIO

EVACUATOR

Continuation of application Serial No. 607,758, filed December 18, 1922. This application filed May 8, 1930. Serial No. 450,859.

My invention relates to devices for removing liquid from systems closed to the atmosphere, especially from vacuum systems used in filling liquids into containers, wherein the overflow is drawn into the system and must be evacuated therefrom back to the liquid supply.

The object of my invention is to operate such devices in a more positive and certain manner, by simple means. Other objects will appear in the course of the ensuing description.

I attain these objects by the device illustrated, for example, in the accompanying drawing, in which—

Figure 1 is a plan view of the device in connection with a vacuum-operated filling apparatus; and

Fig. 2 is a vertical section on the plane of the line 2—2 of Fig. 1.

Fig. 3 is a vertical section of the three-way valve.

The filling apparatus shown is similar to that disclosed and claimed in my co-pending application, Serial No. 544,236, filed March 16, 1922. The filling head 1 has a filling tube 2 entering the container A with a gasket or seal 3 around it against the container top. The vacuum pipe 4 leads from the top of this head, and a small overflow tube 5 leads into the vacuum pipe 4 from an opening out through the side of the filling tube 2 just above the lower open end of this tube, in the container. The supply pipe 6 leads from the lower part of the reservoir 7 up into the annular space around the overflow tube 5 in the head 1, whence the liquid is discharged through the filling tube 2 into the container. A check valve 8 prevents backflow from the head to the reservoir. As air is exhausted from the container A through the vacuum pipe 4, atmospheric pressure on the liquid in the reservoir 7 forces liquid up through the supply pipe 6, past the check valve 8, into the container. When the liquid has risen in the container to the mouth of the overflow tube 5, further inflow of liquid is drawn out through the vacuum pipe 4 until the container is removed, whereupon the pressure is balanced at the open end of the filling tube 2

by the atmosphere, holding the liquid up that remains in the tube; the check valve 8 preventing flow of this liquid back into the reservoir. This description is given merely to exemplify a use of my improved evacuator, which removes from the vacuum pipe 4 the liquid thus overflowing while the container is left on the filling device after filling to the desired height. Fig. 2 shows the disposition of the liquid at this stage of the operation, filling the container, the filling tube, the supply tube, the overflow tube, and the vacuum pipe, and drawing from this pipe into the evacuator.

This evacuator comprises the enclosure 9 having an upper chamber 10, down through the top of which leads the vacuum pipe 4. A continuation 11 of this pipe leads out through this top to a suitable vacuum pump 12 adapted to maintain a desired degree of vacuum in the pipe 4, chamber 10 and connecting pipe 11 as long as driven by the motor 13 to which it is belted.

The enclosure 9 also has the lower chamber 14, and a drain pipe 15 leads from the bottom of the upper chamber 10 down near to the bottom of the lower chamber, where its open lower end is provided with a check valve 16 closing against pneumatic pressure externally of this drain pipe in the lower chamber 14. From the bottom of this lower chamber another drain pipe 17 leads down into the reservoir 7 from which the filling apparatus is supplied; extending far enough down therein for the liquid contents thereof to form a liquid seal around the lower end of this drain pipe 17, which preferably also has a check valve 18 closing against the atmospheric pressure to which the reservoir 7 is exposed.

The three-way valve comprises the casing 19 with one end open and having next to its other end an annular space 20 concentric with the bearing of the shaft of the rotor 21 which fits closely in the casing 19 and has an annular peripheral channel 22 across which extend two partitions 23 a small distance apart relatively to the circumference of the rotor. In the wall of the channel at the outer exposed end of the rotor 21, between the two

partitions 23, is an opening 24; and in the opposite wall of this channel 22 next to the annular space 20 of the casing 19 are holes 25 at intervals throughout the extent of the peripheral channel 22 except between the partitions 23. A pipe 26 leads from the annular space 20 of the casing 19 into the pipe 11 that leads to the vacuum pump 12. Another pipe 27 leads from the upper part of the lower chamber 14 of the enclosure 9, through the wall of the casing 19 and opens in registry with the annular peripheral channel 22 of the rotor 21. The shaft of this rotor 21 has fixed on it a worm wheel 28, meshing with a worm 29 on an extension of the shaft of the vacuum pump 12.

The valve rotor 21 thus is rotated slowly, and most of the time its peripheral channel 22 is connecting the lower chamber 14 of the enclosure 9 with the inlet of the vacuum pump 12 through the holes 25 in the channel wall, the annular space 20 of the casing 19 and the pipe 26 entering the inlet pipe 11. During this time, the smaller part of the channel 22, between the partitions 23, which has the atmospheric inlet opening 24, is closed peripherally by the wall of the casing 19. But while this small part of the channel is passing in registry with the pipe 27 that leads from the chamber 14, atmospheric pressure is admitted through the opening 24 to this pipe 27 and chamber 14; while the partitions 23, against the casing wall exclude this pressure from the remainder of the channel and the vacuum system connected therewith through the holes 25.

Thus, for a short period during each revolution of the rotor 21, the liquid overflowing into the upper chamber 10 from the vacuum pipe 4 freely drains down into the lower chamber 14 through the drain pipe 15, since there is a balanced sub-atmospheric pressure in both chambers 10 and 14. This liquid will remain up in this lower chamber 14 under atmospheric pressure at the outlet end of the lower drain pipe 17 during this time. Then for a much shorter period during each revolution of the rotor 21, the lower chamber 14 is cut off from the vacuum pump 12 and opened to the atmosphere through the rotor opening 24. This pressure closes the check valve 16 at the outlet end of the upper drain pipe 15, since the vacuum continues in the upper chamber 10, connected directly with the pump 12 through the vacuum pipe continuation 11. A balanced atmospheric pressure in the lower chamber 14 and reservoir 7 now exists, and the liquid accumulated in the lower chamber 14 flows freely down into the reservoir 7. Overflow from the vacuum pipe 4 during this short period accumulates in the upper chamber 10, to flow down to the lower chamber 14 as soon as the sub-atmospheric balance is restored by further rotation of the valve rotor 21.

The operation of the device thus is intermittent, but is positive, at regular intervals, as distinguished from more or less uncertainly operating devices dependent upon difference of pneumatic or hydraulic pressure, in prior evacuators, traps and the like. This positive operation is especially advantageous when the liquid overflowing into the vacuum system is heavy, and viscid or sticky, causing sticking of valves which must operate under the control of such pressures in prior devices. An example of such liquids is syrup, or any liquid having a large amount of sugar in it; such liquids being filled into containers by vacuum filling apparatus, such as that herein illustrated, with great facility by the aid of my present invention.

This device is illustrated in conjunction with a filling apparatus, but it will be understood that other uses of it may occur; and while a peculiar use and certain constructional details have been specifically described herein, I do not wish to be understood as being limited to such precise showing and description, but having thus fully described my invention, as is required,

What I claim as new and desire to secure by Letters Patent is:

1. In a vacuum filling system an enclosure in which sub-atmospheric pressure is continuously employed to draw liquid into said enclosure, a second enclosure having an inlet from the first enclosure and having a drainage outlet, a check valve opening inwardly from said inlet, a check valve opening outwardly to the atmosphere from said outlet, and means operated independently of liquid level and pneumatic pressure in said enclosures, to alternately create atmospheric and sub-atmospheric pressures in said second enclosure.

2. In a vacuum filling system, where the overflowing liquid is continuously under sub-atmospheric pressure, means for removing said overflow by gravity to a reservoir open to the atmospheric pressure, by means including an air-tight chamber having a check valve inlet and a check valve outlet, and means operating automatically independently of liquid level in said chamber to rhythmically and alternately produce sub-atmospheric pressure in this chamber or restore atmospheric pressure therein.

3. In a vacuum filling system wherein containers are filled by maintaining a partial vacuum therein until they are filled and overflow and where such overflowing liquid is always under partial vacuum, means to remove this overflow liquid by gravity to an atmospheric reservoir below, comprising an air-tight chamber having a check valved inlet and check valved outlet and communicating by the inlet with the vacuum filling system and means rhythmically timed and operated by a moving part of said filling machine

system so as to drain said chamber by permitting atmospheric pressure therein from time to time to alternate with sub-atmospheric pressure.

5 4. In a vacuum filling system wherein containers are filled by maintaining a partial vacuum therein until they overflow, the overflowing liquid standing under continuous sub-atmospheric pressure, means to remove such
10 overflow liquid from its sub-atmospheric location, including a double check valved closed chamber, the inlet check valve communicating with the overflow, the outlet check valve to discharge by gravity the overflow liquid to an
15 atmospheric reservoir below, and a pneumatic controlling valve rhythmically timed and operated by a moving part of said vacuum filling system, so as to drain the closed chamber by permitting atmospheric pressure
20 therein to alternate with sub-atmospheric pressure.

KARL KIEFER.