

Nov. 5, 1935.

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2,019,896

RECOVERY CONTROL

Filed Feb. 15, 1932

2 Sheets-Sheet 1

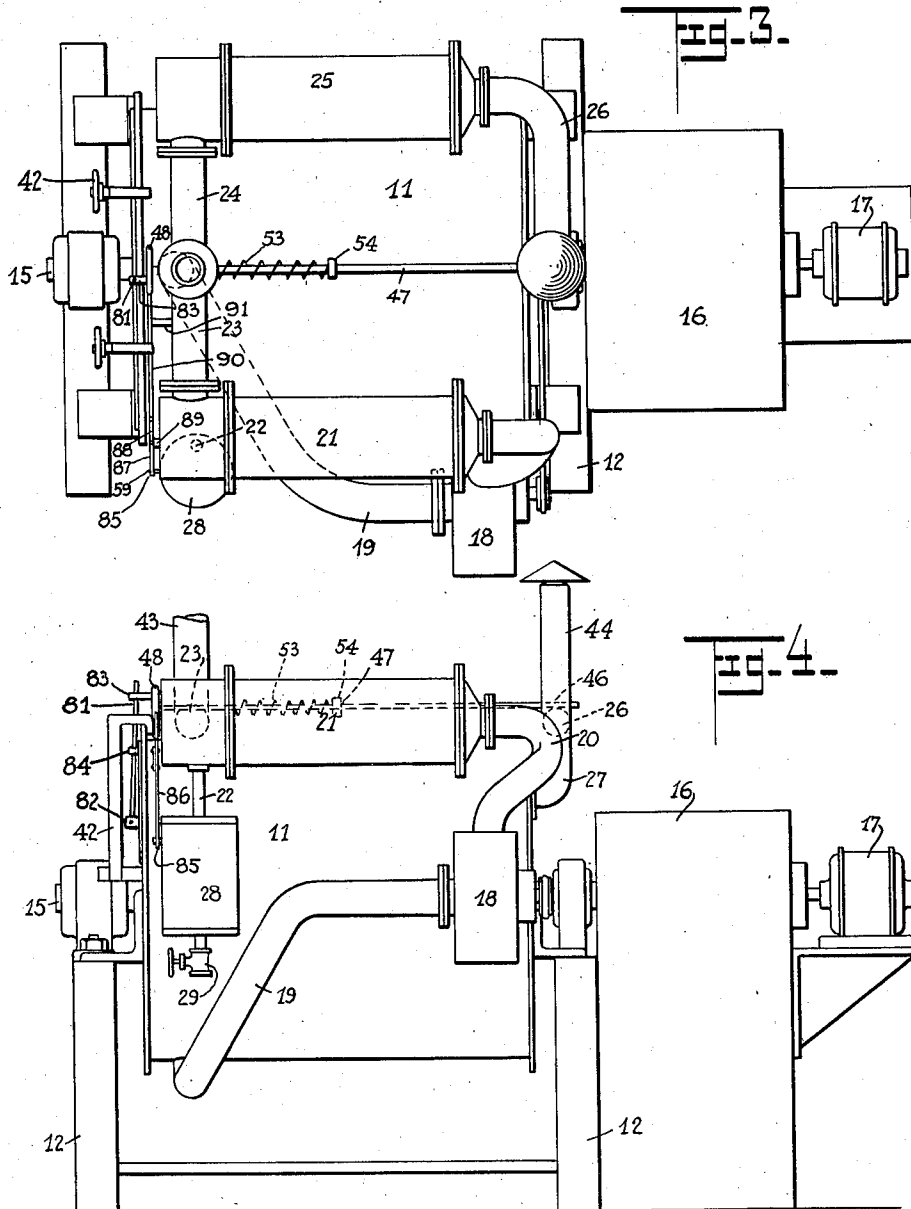
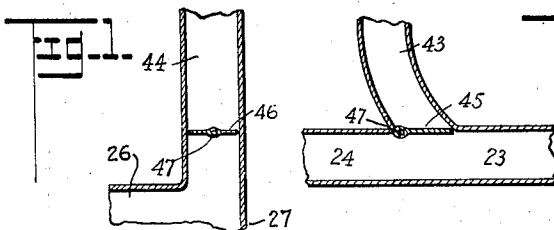


Fig. 2.

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2 Sheets-Sheet 2

Fig. 6.

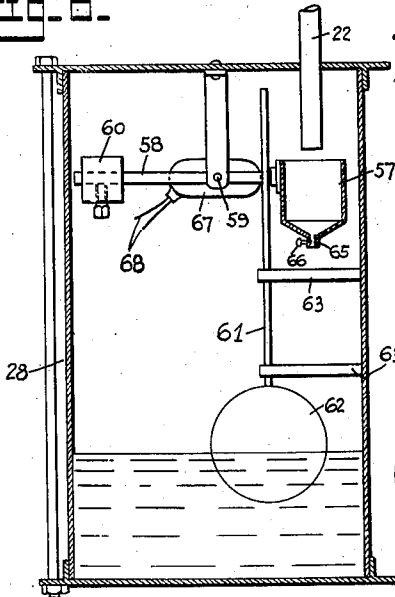


Fig. 8.

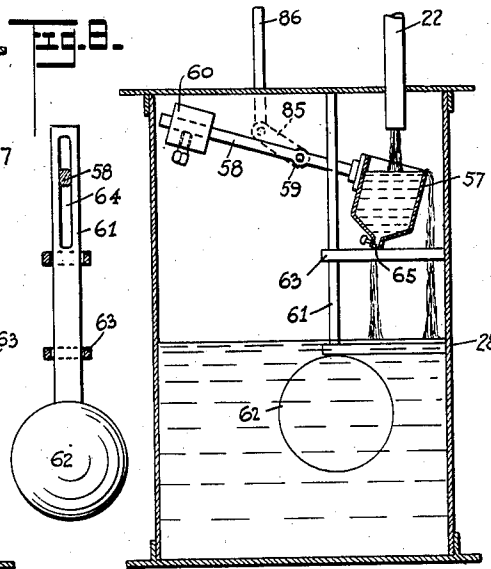


Fig. 9.

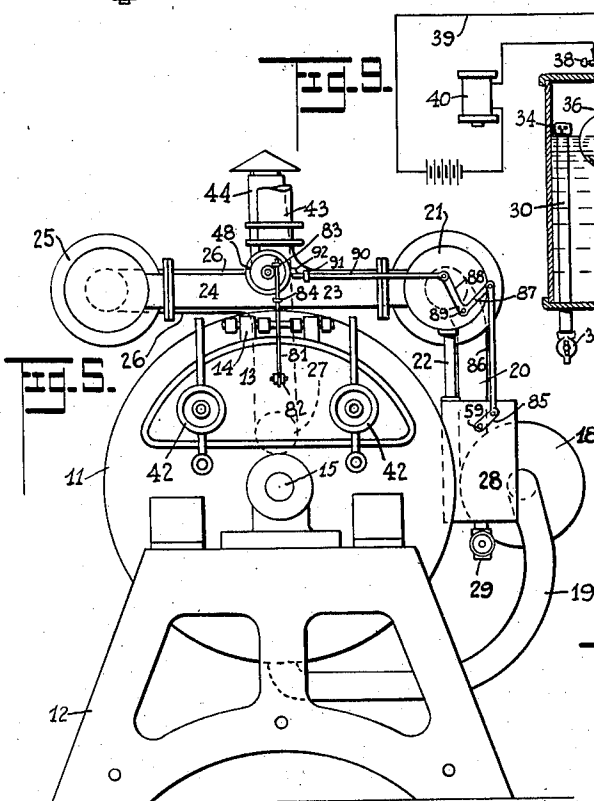


Fig. 7.

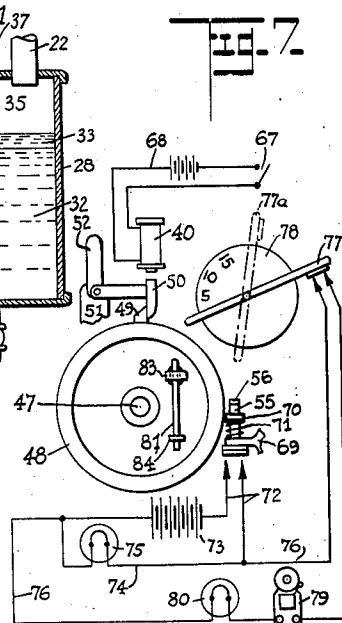


Fig. 10.

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## UNITED STATES PATENT OFFICE

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## RECOVERY CONTROL

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16 Claims. (Cl. 34—3)

This invention relates to drying, cleaning or deodorizing devices in which a change of operating steps is to be brought about in the normal course of the operation of such a device.

5 More particularly it relates to apparatus in which cleaning or treating fluids are volatilized and where a change in the procedure is to be brought about, whenever a certain stage of volatilization has been reached.

10 More particularly this invention applies to degreasing, cleaning or drying processes, in which materials are washed, laundered or cleaned in a cleaning fluid, said cleaning fluid being subsequently removed from the material; at a certain stage of the removal, or thereafter, a change in the connections of the device is brought about in order to subject the material or the surrounding atmosphere to another process, deodorizing and ventilating for instance.

20 One object of this invention is therefore to bring about the automatic changes in the connections of the device in which materials are subjected to cleaning fluids, when said cleaning fluids have been removed from the material. The cleaning fluid being removed ordinarily by volatilization, the amount volatilized is measured, for instance by condensation in measurement means; the change of connections is brought about when the measuring means register a certain amount  
30 of the condensed cleaning fluid.

Another object of this invention is to control the operations of a cleaning device by measuring the flow of cleaning fluid withdrawn from the materials cleaned and bringing about a change  
35 of operations or connections, or giving a signal when such flow has been predeterminedly reduced.

Another object of this invention is to provide means for drawing the attention of the operator to the end of a certain step of operation, the  
40 period required for such a step changing according to circumstances.

Another object of this invention is automatically to begin another operation in a device of the kind described after a preceding step of a certain duration has been finished.

45 A further object of this invention is automatically to follow a step of operation the duration of which varies, by another operating step of a fixed duration.

50 One further object of this invention is to change the setting of a cleaning and degreasing device from a position appertaining to one of the operations to that appertaining to another step of the operation, automatically or simple manipulation;—and then to allow resetting of the device

for the first operating step by means of an intermediary collateral operation to be performed by the operator.

These and other objects I attain by means exemplarily described in the following and illustrated by the accompanying drawings in which:—

Figs. 1 and 2 show, in sectional views, a one-way and a two-way valve, operating on the principle of dampers.

Fig. 3 shows the top view of a machine in connection with which my invention may be applied.

Fig. 4 shows a corresponding side elevation.

Fig. 5 shows a corresponding end view.

Fig. 6 shows a rear view of one modification of a measuring device used for my invention.

Fig. 7 shows, in the same rear view, a slightly modified device in a different position of operation.

Fig. 8 is the side view of a float used in connection with the measuring means of Figs. 6 and 7.

Fig. 9 shows a modification of the measuring means.

Fig. 10 shows the automatically operated valve gears in connection with a timing device and a wiring diagram.

Similar numerals refer to similar parts throughout the various views:—

The machine illustrated in Figs. 3, 4 and 5 shows a tank 11 supported on stands 12. A door 13 with locking means 42 is provided at the front of tank 11, and is suspended from a hinge 14 so as to swing up and down; through the door the materials to be processed are introduced into the tank and withdrawn therefrom. In the tank is 35 rotatably supported an element (not shown) which serves to agitate the material contained therein, said element is mounted upon a shaft 15 which is journaled outside of the tank. The said shaft is connected by a variable transmission 16 to a motor 17. The shaft 15 and the agitating element supported thereon in tank 11 are adapted to be oscillated or rotated according to different mechanical connections provided in transmission 16. Thus a tumbling motion is provided for a cleaning of the material contained in the tank. The shaft may be rotated at a high speed so as to use the tank as a whizzer; and the different oscillating and rotating movements may otherwise be used during the centrifuging, 50 cleaning and drying operations.

The device which this invention is concerned in, pertains to steps which follow the tumbling, the washing and the high speed extracting steps. Both of the steps I here have reference to may 55

take place while the material in the tank is being tumbled or is agitated in some manner, but the material may also be at rest.

The first step I have reference to is a drying step, the second one, a ventilating or deodorizing step.

Under drying, I understand the removal of the washing fluids which remain in the material which has been degreased or cleaned. This removal is brought about in the device shown in Figs. 3, 4 and 5, by means of a closed circuit, which comprises the motor driven exhaust fan 18. The inlet of the fan 18 is connected by a conduit 19 to the bottom or to a low point of the tank 11. The cleaning fluid and impurities contained therein are thus sucked away from the material contained in the tank 11. That mixture of vapors and gases is driven by the fan 18 through the conduit 20 into a suitably cooled condenser 21, in which the said mixture is cooled off, so that the vapors contained therein condense and are drained through pipe 22. The part of the mixture which has been driven through condenser 21 by means of fan 18 and which has not been condensed, proceeds from the condenser 21, through transverse conduits 23 and 24 to a heater 25. The latter, which is suitably heated, by a steam jacket for instance, delivers hot gases through a conduit 26, in the rear of the machine into a downwardly directed conduit 27, which opens into the tank 11. The hot gases which thus enter upon the tank, circulate through the materials contained in the tank, and volatilize and engage upon the fluids and foreign matters remaining in said material, the mixture of said gases and said fluids leaving the tank again by the conduit 19, so that the aforementioned closed cycle through the fan 18 continues indefinitely.

The pipe 22, through which the fluids condensed in condenser 21 are drained therefrom, opens upon an upright container 28 which may be made of transparent material so as to show the amount of fluid condensed, and which may be emptied into a storage, reserve or reclaiming system by means of a valve 29. The container 28 (Fig. 9) is shown to be provided with a drain-pipe 30 closed at its lower end by a valve 31. The said drain 30 opens upon the inside of container 28 in the manner of an overflow at a comparatively high point by means of perforations 34 provided near its upper end. While the cleaning fluid 32 is being drained through valve 29, the water 33,—which has collected on top of cleaning fluid 32, and which is lighter than ordinarily used cleaning fluids, such as carbon-tetra-chloride,—may be drawn off the top of the cleaning fluid through the perforations 34 when the valve 31 is opened for that purpose.

In the container 28 of the modification of Fig. 9 I provide a float 35 which acts independent of the drain 30. From the float 35 slidably extends a rod 36 through the top of container 28. Outside of the container, the electric circuit closing member 37 is adjustably mounted upon rod 36 by means of a set screw 38. The member 37 normally rests upon the cover of container 28. When the float 35 is raised by the rising level of the liquid in container 28, the member 37 closes an electric circuit 39 which comprises an electro-magnet 40. The action of the electro-magnet 40 will be described below, in combination with the explanation of the diagram of Fig. 10.

In the ordinary routine of using the device of Figs. 3, 4 and 5, the operator acquaints himself

with the amount of cleaning fluid which is removed during the above described evaporating or drying operation from a certain quantity of material, which has been placed into the tank 11. He notices what level is reached by the condensed fluids 32 and 33 in container 28, after substantially all of such fluids have been driven off the material contained in tank 11, and the container 28 may be suitably marked; or the rod 36 may be provided with markings 41, which enable the operator to set the member 38 at a point, where the circuit 39 is closed by the float 35, at the proper point of time.

The above described drying step of the operation, which was exemplarily described by means for driving fluids off the material which had been treated in tank 11, is ordinarily followed by a step, in which the material contained in the tank is deodorized or ventilated before it is removed from the tank. This step may take place while the material is suitably agitated by the element provided on shaft 15. The deodorizing or ventilating is ordinarily brought about by the circulation of fresh air through the tank 11. For such purposes the part of the closed circuit of fan 18 is converted, by providing suitable connections to the air at both ends of the part of the circuit comprising the fan 18, the conduit 19 and the tank 11.

In the prior art this was sometimes brought about by providing a butterfly valve or damper (not shown) upon conduit 24, by means of which the connection between conduit 23 and the heater 25 was cut off. Between the conduits 23 and 24, an exhaust conduit 43 connected from the closed circuit to the outside of the building, which also was provided with a butterfly valve or damper, not shown. That valve was closed during the drying step and was opened during the ventilating or deodorizing step, so that the gases withdrawn from tank 11 by means of fan 18 were expelled therethrough into the open air.

Another conduit 44 was connected between conduits 26 and 27 and that conduit was provided with a third damper or butterfly valve (not shown) which was also closed during the drying step, but it was opened in order to permit the access of fresh air for the deodorizing or ventilating step.

For the purpose of my novel arrangement I show a two-way valve 45 (Fig. 2), which is connected between the conduits 23, 24 and 43 in such a manner that it closes conduit 24,—providing a connection between 23 and 43,—when in a vertical position, and that it closes conduit 43,—providing a free connection between conduits 23 and 24,—when swung into the horizontal position of Fig. 2.

Fig. 1 shows a damper 46 arranged in conduit 44. It closes the said conduit when in a horizontal position, whereas it allows air to be taken in through said conduit when swung into a vertical position. I coaxially align the valves 45 and 46, connecting them by a common shaft 47, and provide an operating wheel 48 at the front of shaft 47 on the machine of Figs. 3, 4 and 5.

Upon the circumference of wheel 48, I provide a tooth 49, (Fig. 10), which is engaged by a catch 50 swingably mounted upon a lug 51 extending from the stationary parts of the machine. The catch 50 is provided with a handle 52 permitting manual operation thereof. Upon the shaft 47 is wound up a spring 53, which is engaged at one end upon the stationary conduit parts 23, 24 or 43 surrounding shaft 47, and at the other end

upon a collar 54 mounted upon shaft 47, said spring tensioning the shaft 47 in a clockwise direction so that the tooth 49 is engaged by catch 50. In this position of shaft 47, the valves 45 and 46 are in the position shown in Figs. 2 and 1.

When the catch 50 is released, the shaft 47 snaps through 90°, under the tension of spring 53, opening conduits 43 and 44 and closing conduit 24. At the end of the 90° rotation, the rotation of the shaft is intercepted by a suitable stop. Such a stop is not shown in the drawings but the switch rod 55, which is shown in Fig. 10, and the action of which will be explained later, serves the same purpose and may be provided with a rubber tip 56 at its upper end which intercepts the tooth 49.

Figs. 6 and 7 show modifications of the arrangements in tank 28. Whereas in the prior instance I measured the fluid which had been condensed, I here make use of a measurement of the flow of the said fluid. Here the pipe 22 opens onto a small cup 57, which is mounted upon the free end of a lever 58 fulcrumed by a shaft 59, upon the container 28. The lever 58 is provided with a counter weight 60 at its other end, that counter weight causing the lever 58 to tilt in counter-clockwise direction into the horizontal position of Fig. 6, when the cup 57 is substantially empty, whereas the lever 58 is turned in clockwise direction to the position of Fig. 7, when the cup 57 is filled with the fluid or when the right arm of lever 58 is pulled down by the slotted arm 61 of the float 62 which will be presently explained.

The slotted arm 61 is vertically slidably supported by brackets 63. The float 62 will be carried, by the liquid rising in container 28, against the bottom of the lower bracket 63.

The float 62 rests upon the bottom of container 28, when said container is empty, or substantially empty. In that case, the lever 58 extending through the slot 64 in arm 61 will be engaged on the upper end of said slot and will be retained in the position of Fig. 7. As soon as the liquid rises in the container 28, and lifts the float 62 and the arm 51, the said arm releases the lever 58 so that it may be shifted by counterweight 60 into the horizontal position of Fig. 6, unless the cup 57 is filled with liquid, as shown in Fig. 7.

The cup 57 is provided with an outlet 65 at a low point, which preferably comprises means for regulating the flow therethrough; for instance it may be enlarged or made smaller by the setting of a small screw 66. The opening 65 is of such limited size that it will not dispense the liquid at the rate it is issued into cup 57 by pipe 22, while the bulk of the cleaning fluid is being condensed in condenser 21 and being discharged through pipe 22. However, when the cleaning fluid has been substantially driven off the material contained in tank 11, the contents of cup 57 will drain through opening 65, faster than they are supplied through pipe 22, so that the cup becomes empty, and the conduit 60 swings the lever 58 into a horizontal position.

At this point the evaporating or drying step of the operation is finished and the operation is shifted to the next operation, the deodorizing or ventilating step by the means to be presently explained. In the arrangement of Fig. 6, I show a mercury switch 67 to be connected to the shaft 59 of lever 58. The switch 67 closes the circuit 68 of the wires connected thereto, when in the position of Fig. 6, whereas the circuit is open when the switch lever 58 is tilted as shown in Fig. 7.

The circuit 68 corresponds to the circuit 39 of Fig. 9, and the switch 67 is comprised in said circuit together with the electro-magnet 40, as shown in Fig. 10. When these circuits are closed by switch member 38 or by the mercury switch 67, the electro-magnet 40, which is stationarily mounted upon the machine, attracts the catch 50, so that the wheel 48 is released in the aforementioned manner, and the valves 45 and 46 are changed from their position of the drying-recovery or volatilizing step of operation to their position during the deodorizing or ventilating step of the operation.

The switch rod 55 is supported by a bracket 69 which is stationarily mounted upon the machine. The rod 55 carries a collar 70 and a compression spring 71 disposed between the bracket 69 and collar 70, normally retains the switch 55 in a raised position. The tension of compression spring 71 is however overcome, when the tooth 49 of wheel 48 comes to rest on top of the switch rod 55 after having been released by the catch 50, so that the switch rod 55 then closes the circuit 72. The circuit 72 comprises the source of energy 73, and, in parallel, the circuit 74 of signal means 75 and another circuit 76, which will be described below. The circuit 74 being closed by switch 55, a signal is given that the machine has been changed from the drying or evaporating step of operation.

The lever 77 of the time switch 78 is normally in the closed position shown in Fig. 10. It is provided with a mechanism well known to those acquainted with the respective art, according to which the lever 77 will return within a certain period of time from a position 77a, into which it has been swung by outside actuation, into the closed position 77. The switch 78 is set so as to swing from position 77a to position 77 in the interval of time required for the deodorizing or ventilating step. The switch lever 77 is swung from a closed position to the open position 77a by being engaged at the free end by tooth 49, when the wheel 48 and shaft 47 snap through 90° under pressure of spring 53. The lever 77 is released from the tooth 49 when it has been swung to the position of 77a the tooth sliding therefrom onto the switch rod 55. When the switch 78 closes the circuit 76 at the end of the deodorizing or ventilating operation, the circuit 72 having previously been closed, the alarm 79 and signal light 80 contained in circuit 76 are actuated and will remain actuated until the wheel 48 is returned to the position shown in Fig. 10, in which it is engaged by catch 50. The tooth 49, or the lever 77 are suitably arranged in a manner well known to those acquainted with the art of escape movements so that they freely pass each other upon the return movement of wheel 48.

The return movement of wheel 48 may be brought about manually by rotating it in counterclockwise direction, or this operation may be brought about by some other incidental operation, or by the opening or closing of door 13 of the tank, as will be explained below. It will, however, be noticed that the tooth 49 will not be engaged by the catch 50 unless the electro-magnet 40 is de-energized. In other words, the container 48 must be emptied before a new operation of the apparatus may be started.

The wheel 48 is operatively connected to the door 13 by means of a connecting rod 81. The said rod is universally hinged at 82 on door 13, it slidably extends through a bracket 83 which

is rotatably mounted upon wheel 48 and it is provided with a collar 84, which engages upon the bracket 83 from below, when the door 13 is opened. During the opening of the door 13, the wheel 48 is swung to such an extent in counter-clockwise direction that the tooth 49 may be engaged by catch 50, when the door 13 is closed again.

Whereas the device of Fig. 6 is shown to be operatively connected with the valve operating mechanism by means of the switch 67 and the circuits of which said switch forms part, these connections may also be of a mechanical character, as indicated in Figs. 3, 4, 5 and 7. From the shaft 59 of lever 58 (Fig. 7) extends, upon the outside of the container 28, a lever 85, which, in the manner of a bell crank arrangement, connects by means of a rod 86, of a double lever 87, 88 which is stationarily fulcrumed at 89 on the stationary parts of the machine and of a rod 90, which is longitudinally slidably supported by bracket 91 mounted upon the stationary parts of the apparatus, into operative engagement with a tooth 92 extending from the wheel 48, said tooth 92 corresponding in its functions to the tooth 49 shown in Fig. 10. In other words, the tooth 49 is normally engaged by the free end of rod 90, but the wheel 48 will snap through 90° in clockwise direction when actuation of lever 85 by a counter-clockwise rotation of lever 58 pulls the rod 90 away from the wheel 48, so that the tooth 49 is released. Any alarm signals and control relays may of course be actuated by the lever system connecting the lever 58 to the wheel 48 in the same manner in which relays and other signals, which bring about other operations of the apparatus, may readily be connected into the circuits 72, 74, 76 and 39.

While I have shown and described my invention with some degree of particularity, it will be realized that other modifications and changes may be resorted to under special conditions. I therefore do not wish to be limited and restricted to the exact details shown and described, but reserve the right to make such changes and modifications as may fairly fall within the scope of the subject matter now being claimed.

What I claim is:—

1. In combination with a tank in which textiles are subjected to treatment by a fluid, means withdrawing from said tank some of said fluid in vapor form, means condensing and measuring the fluid withdrawn from said tank, and control means on said fluid withdrawing means actuated by said measuring means and substantially terminating the fluid withdrawal when a predetermined quantity of fluid has been measured off.

2. In combination with a tank in which textiles are subjected to a cleansing treatment by a volatile fluid, means withdrawing from said tank some of said fluid in vapor form, means condensing and measuring the fluid withdrawn from said tank, and means actuated by said measuring means to disconnect said withdrawing means and substantially to terminate the fluid withdrawal.

3. In combination with a tank in which textiles are subjected to treatment by a fluid, means withdrawing from said tank, some of said fluid in vapor form, means condensing and measuring the flow of the fluid withdrawn from said tank, and control means on said withdrawing means actuated by said measuring means.

4. In combination with a tank in which materials are subjected to treatment by a fluid, means

withdrawing said fluid from said tank, means measuring the fluid withdrawn from said tank, ventilating means connecting said tank with the atmosphere, and means controlling said withdrawing and ventilating means and actuated by said measuring means.

5. In combination with a tank in which materials are subjected to treatment by a fluid, a closed condenser circuit, means circulating the atmosphere contained in said tank through said condenser circuit, an air intake and an air outlet connected with said circuit, and substantially alignedly fulcrumed and operatively connected valve doors on said circuit, intake and outlet.

6. In combination with a tank in which materials are subjected to treatment by a fluid, a closed condenser circuit, means circulating the atmosphere contained in said tank through said condenser circuit, an air intake and an air outlet connected with said circuit, valve means on said circuit, intake and outlet, means mechanically connecting said valve means for simultaneous operation thereof, means measuring the fluids condensed in said circuit, and means operatively connecting said connecting and said measuring means.

7. In combination with a tank in which materials are subjected to treatment by a fluid, a closed condenser circuit, means circulating the atmosphere contained in said tank through said condenser circuit, an air intake and an air outlet connected with said circuit, valve means on said circuit, intake and outlet, means mechanically connecting said valve means for simultaneous operation thereof, means measuring the flow of the fluids condensed in said circuit, and means operatively connecting said connecting and said measuring means.

8. In combination with a tank in which materials are subjected to treatment by a fluid, a closed condenser circuit, means circulating the atmosphere contained in said tank through said condenser circuit, an air intake and an air outlet connected with said circuit, valve means on said circuit, intake and outlet, means mechanically connecting said valve means for simultaneous operation thereof, a door on said tank for placing materials therein, and means operatively connecting said connecting means with said door.

9. In combination with a tank in which materials are subjected to treatment by a fluid, a closed condenser circuit, means circulating the atmosphere contained in said tank through said condenser circuit, an air intake and an air outlet connected with said circuit, valve means on said circuit, intake and outlet, and means mechanically connecting said valve means for simultaneous operation thereof, means measuring the fluids condensed in said circuit, a time switch, means operatively connecting said connecting and said measuring means, and actuating said time switch.

10. In combination with valve gears for changing the connections of a cleaning apparatus after the cleaning fluids have been driven off, means condensing said driven off fluids, and means engaged by said condensed fluids and operatively connected with said gears.

11. In combination with valve gears for changing the connections of a cleaning apparatus after the cleaning fluids have been driven off, means condensing said driven off fluids, a second means engaged by said condensed fluids and operatively connected with said gears, a container receiving the condensed fluids, and a float in said con-

tainer operatively connected with said second means.

12. In combination with valve gears for changing the connections of a cleaning apparatus after the removal of cleaning fluids, means condensing said fluids, a shiftable cup engaged by said condensed fluids during their removal and operatively connected with said gears, and means continuously draining said cup.

13. In combination with valve gears for changing the connections of a cleaning apparatus after the removal of cleaning fluids, means condensing said fluids, a shiftable cup engaged by said condensed fluids during their removal and operatively connected with said gears, and adjustable means continuously draining said cup.

14. In combination with valve gears for changing the connections of a cleaning apparatus after

the cleaning fluids have been driven off, means condensing said fluids, means actuated by said condensed fluids and predeterminedly engaging said gears while thus actuated.

15. In combination with valve gears for changing the connection of a cleaning apparatus after the cleaning fluids have been driven off, means condensing said fluid, and means actuated by the speed of flow of said condensed fluids and actuating a signal when they are thus actuated.

16. In combination with the control means of a drying apparatus for materials in which fluids are driven off said materials and condensed, means dispensing the condensed fluids, and means actuated by said dispensed fluids and actuating said control means when said dispensing ceases.

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