

A. C. DURDIN, JR.
STEAM HEATING SYSTEM.
APPLICATION FILED NOV. 21, 1910.

1,065,226.

Patented June 17, 1913.

4 SHEETS—SHEET 1.

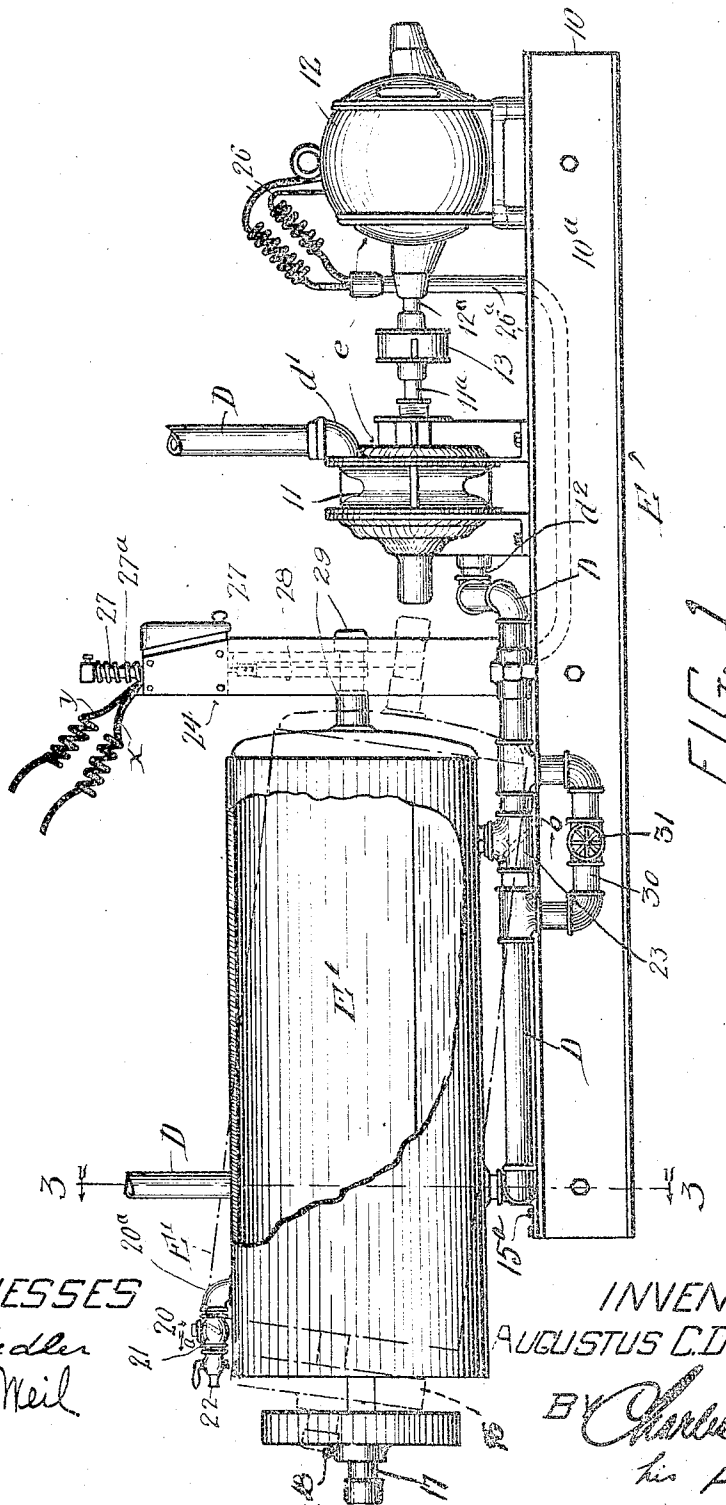


FIG. 1

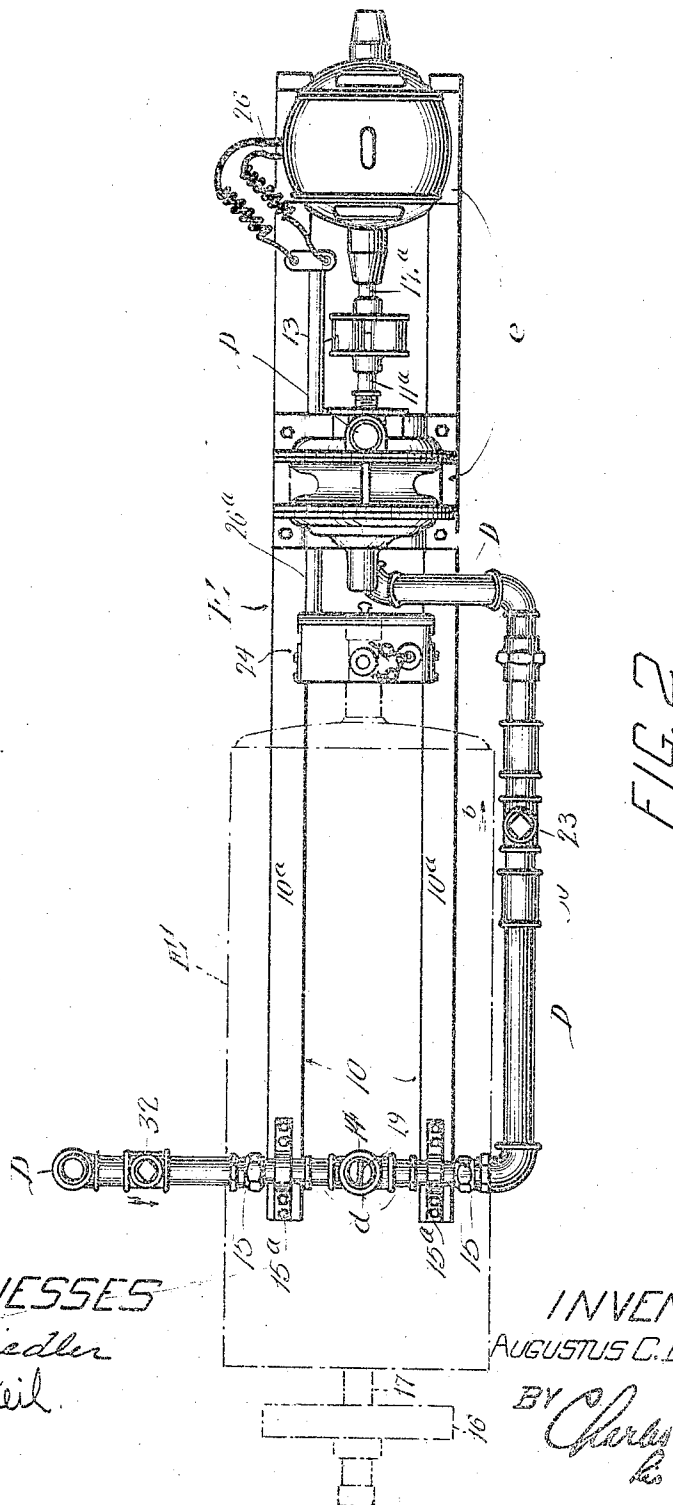
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4 SHEETS--SHEET 2.



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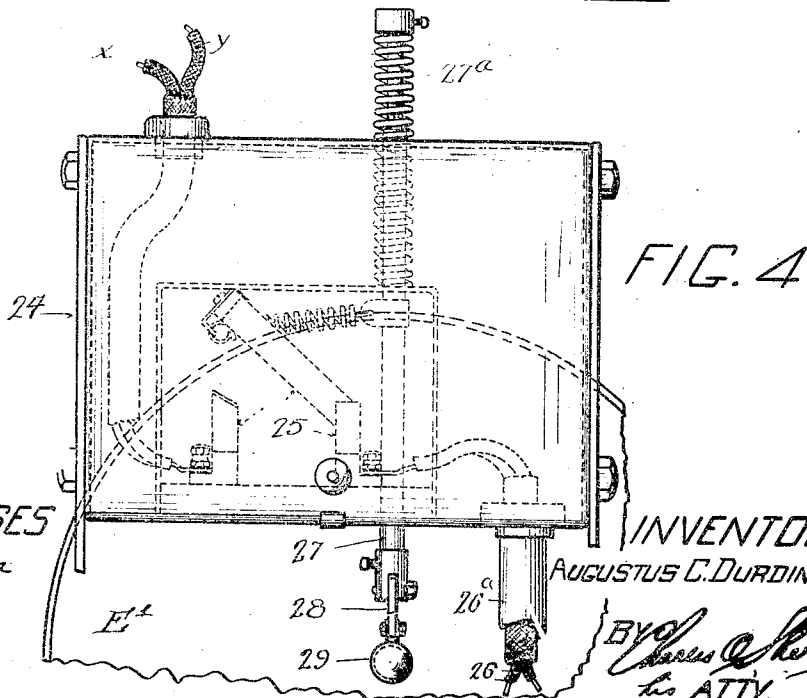
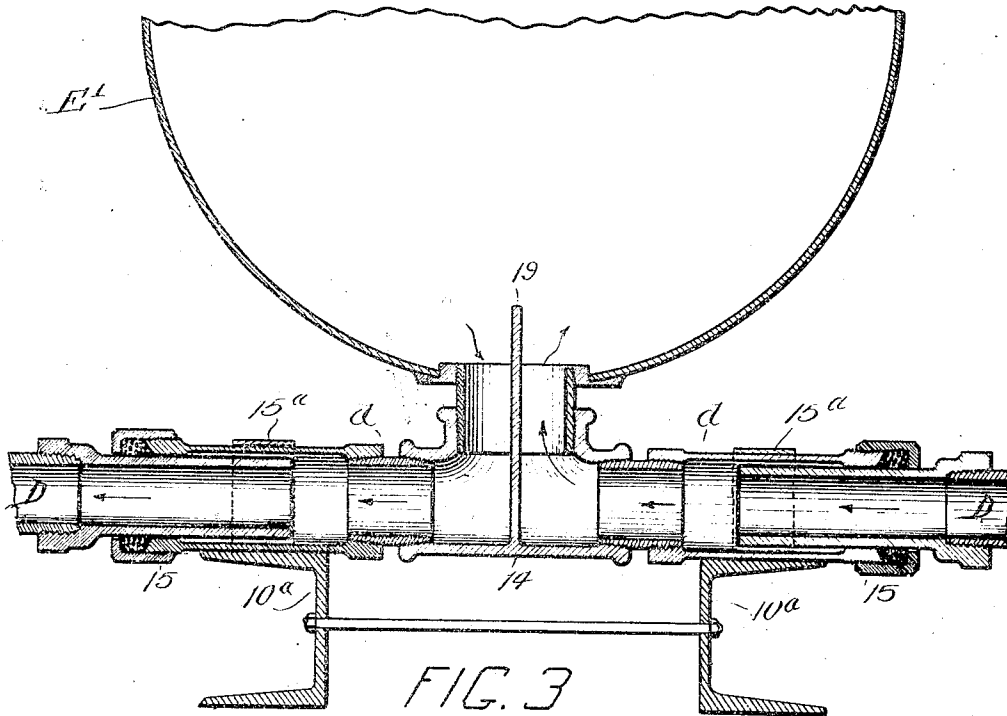
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4 SHEETS—SHEET 4.

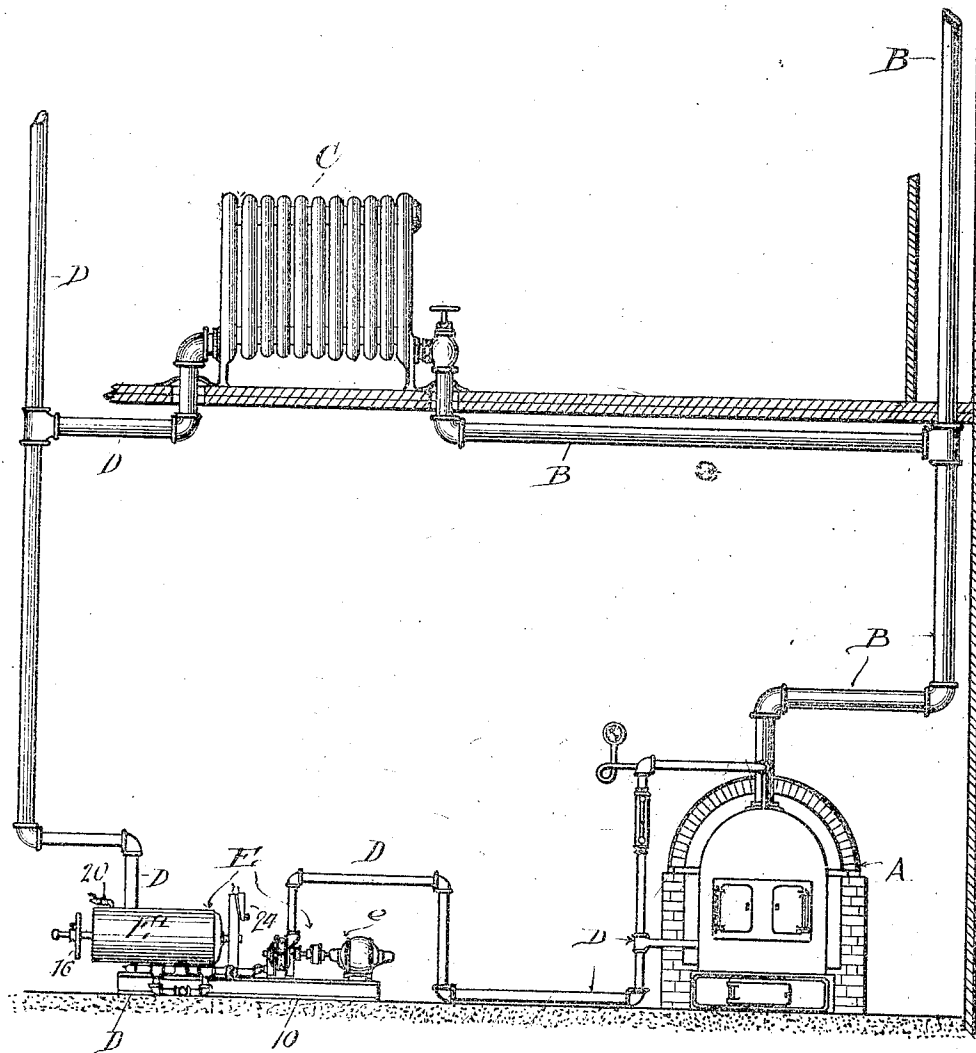


FIG. 5

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UNITED STATES PATENT OFFICE.

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STEAM-HEATING SYSTEM.

1,065,226.

Specification of Letters Patent.

Patented June 17, 1913.

Application filed November 21, 1910. Serial No. 593,326.

To all whom it may concern:

Be it known that I, AUGUSTUS C. DURDIN, Jr., a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Steam-Heating Systems, of which the following is a specification.

This invention relates to steam heating systems, and more particularly to the apparatus associated therewith for taking care of the steam, air and water of condensation and delivering the water to the source of steam supply, or elsewhere as desired.

One of the objects of this invention is to provide means for economizing fuel in systems of this sort, for increasing the efficiency of the steam plant, for dispensing with individual regulating valves for the radiators and for simplifying and otherwise improving upon the apparatus for taking care of the steam, air and water of condensation.

To such ends this invention consists in a suitably operated pumping mechanism connected with the return pipe of the steam plant, a receiver having a vent, controlled by an outwardly opening check valve, and communicating with the return pipe and adapted to receive air and the water of condensation, and controlling means, actuated by said oscillatory receiver, for starting and stopping the pumping mechanism.

The invention further consists in the novel features of construction, arrangement and combination of parts hereinafter particularly set forth and defined in the claims.

The invention is clearly illustrated in the drawings furnished herewith, in which:

Figure 1 is a side elevation of an apparatus embodying the preferred form of the invention, showing the shell of the receiver partly broken out, Fig. 2 is a plan view of the parts seen in Fig. 1, with the receiver removed therefrom, Fig. 3 is an enlarged vertical cross section on the line 3-3 of Fig. 1, Fig. 4 is an enlarged end view of the controlling device and Fig. 5 is a view of a steam heating system with my invention applied thereto.

Referring to said drawings and particularly to Fig. 5, which illustrates a two pipe system, a source of steam supply, shown in the form of an ordinary boiler, A, will be seen, from which leads a main steam pipe B, that connects with radiators or other heating coils, one of which is seen at C. A return pipe D, connects with said radiators or

coils and conducts the water of condensation back to the source of steam supply or elsewhere as desired. My improved apparatus for taking care of the steam, air and water of condensation is seen at E, and is interposed in the return pipe as will appear more fully in the course of this specification.

Referring now to Figs. 1 and 2, which illustrate the invention in its preferred form, a supporting frame 10, is here shown as comprising two connected beams 10^a, which are adapted to support the operative portions of the apparatus. Supported on one end of said frame is a pumping mechanism *e*, here shown in the form of a pump 11, operatively connected with a motor or engine 12, preferably in the form of an electric motor. The pump is preferably of the centrifugal type and its shaft 11^a, is connected with the shaft 12^a, of the motor by a coupling 13. It is to be understood, however, that this particular construction and arrangement of pumping mechanism is not material to my invention, broadly speaking, but forms a simple and effective one for pumping the water of condensation back into the boiler. The return pipe D, opens into the intake of the pump at *d*², and the pump discharges into the return pipe at *d*¹, from which point said return pipe leads to the boiler. Supported at the opposite end of the frame 10, is a pivotally sustained receiving tank or receiver E', which is capable of vertical oscillations upon its fulcrum. When the receiver is in the form of a cylindrical tank, its pivotal point is arranged at one side of its center as seen in Fig. 1, in order that the water which accumulates therein may tilt the longer end down into the position shown in dotted lines in said figure.

Various forms of pivotal connections for the receiver are obvious to those skilled in the art and a very simple one will now be described. The return pipe is shown as extending underneath the receiver E', at *d*, and provided with a T coupling 14; one arm of which supports the receiver and opens into the same, so as to place the return pipe D, into communication with its interior and permit the water which accumulates therein to be discharged. That portion of the return pipe underneath the receiver is journaled upon the frame 10, and as shown may be held in place thereon simply by straps 15^a, bolted to the beams and extending over the section *d*, of the return pipe. The rock-

ing section *d*, is coupled to the adjacent ends of the stationary portions, preferably by expansion joints 15, so as to make a steam tight fit therewith and to permit of the rocking movement of the section *d*. This particular construction of connection between the receiver and return pipe is, however, not essential, but is one of the many forms that may be employed in connecting the oscillatory receiver with the return pipe. The long end of the oscillatory receiver is counterbalanced by suitable mechanism, here shown as a counterweight 16, carried by the short end of the receiver, said counterweight operating to overcome the weight of the long end when emptied or partially emptied of water and raising said end. Said counterweight is preferably carried by a stud shaft 17, on the end of the receiver and is held in place by a set screw 18, threaded in the counterweight, said screw bearing against the stud shaft 19. The amount of water which accumulates in the receiver, before its discharge therefrom, may be regulated by shifting the counterweight along its support and in this way a very fine adjustment may be had.

Means are provided for directing the water of condensation into the receiver before it passes by the T coupling 14, on its way to the pump and a simple form of means for accomplishing this object, comprises a partition 19, extending transversely across the T coupling 14, as shown in Figs. 2 and 3, said partition projecting into the receiver and causing the water to pass up through the T coupling on one side of the partition, then around or over the same in the receiver and down into the opposite side of the T coupling. The indirect passage causes the air or steam carried with the water, to bubble up through the water and rise in the receiver, and a vent 20, is provided on said receiver, through which the air and steam may escape. As shown, said vent may comprise a fitting 20^a, screwed into the shell of the receiver, and a check valve 21, on the other end of said fitting, arranged to permit the passage of air or steam there-through in the direction of the arrow *a*, but preventing the return of air into the receiver. A petcock 22, is preferably secured upon the end of the check valve and is opened to regulate the escape of air and steam that may accumulate in the receiver E'. A check valve 23, is interposed in the return pipe between its connection with the receiver and the pumping mechanism, said check valve permitting the water to pass therethrough in the direction of the arrow *b*.

The rocking motion of the receiver is utilized to start and stop the pumping mechanism, whereby said pumping mechanism will be caused to operate intermittently, and only when a predetermined

quantity of water has accumulated in the receiver. The controlling device 24, for the pumping mechanism is actuated by the oscillatory receiver E', and is here shown in the form of an electric switch 25, connected with the terminals *x*, *y*, of an electric circuit, and connected with conductor wires 26, confined in a conduit 26^a, and running to the motor 12. The switch has a switch actuating rod 27, connected to the receiver E', as by a link 28, that is attached to a stem 29, secured to the receiver. A spring 27^a, is confined between the head of the rod 27, and the switch frame and acts to yieldingly resist the downward movement of the longer end of the receiver.

It is obvious that the particular construction and arrangement of the parts just described is not essential to the invention, broadly considered, as there are many forms, well known to those skilled in the art, for operatively connecting the oscillatory receiver with the switch, whereby the oscillatory movements of said receiver may actuate the switch to open and close the circuit therethrough. A bypass 30, controlled by a valve 31, extends around the check valve 23, which bypass may be operated to allow water to flow from the boiler back to the receiver, and a check valve 32, is interposed in the return pipe on the opposite side of the receiver.

In the operation of the apparatus, steam is supplied to the radiators or other heat radiating devices,—forcing the air contained therein, out through the check valve 21 and petcock 22. As the steam condenses in the radiators and pipes, it flows back through the return pipe and into the receiver E', the longer end of which is held in its upper position by the counterweight 16. Whenever sufficient water accumulates in the receiver to overbalance the counterweight, the long end of the receiver tilts downward, closing the switch 25, through its connections therewith and starting the motor of the pumping mechanism. The pumping mechanism then empties the receiver and pumps the accumulated water back into the boiler, whereupon the counterweight overbalances the long end of the receiver, and the latter moves back into its former position, thereby opening the switch and turning off the electric current from the motor, causing the same and its connected pump to cease operation. As the water discharges from the receiver, the pressure therein lowers sufficiently to cause a partial vacuum therein, and the water of condensation again accumulates in said receiver. Any air or steam carried with the water is free to rise in the tank and fill the same and if the pressure becomes greater than that of atmospheric pressure, the steam or air may escape through the vent at the upper end of the receiver. The

back pressure from the boiler is held back from the receiver E', by the check valve 23, permitting water of condensation from the radiators to flow into the return pipe D, as far as the check valve before the accumulated water in the receiving tank overbalances the counterweight 16. In closing down the plant, the valve 31, may be opened, allowing water from the boiler to fill the receiver. When starting the plant, the valve 31, is first closed, and the electric current turned on. The receiver having been tilted down by the weight of water, the pump starts immediately and empties the receiver, lowering the pressure therein, and drawing live steam into the radiators.

The apparatus is not only applicable to steam heating systems, but to other steam plants where it is desired to collect the water of condensation and return the same to the boiler. Furthermore, it is applicable to single pipe systems as well as two pipe systems, also to high or low pressure systems.

I am aware that various alterations and modifications of this device are possible without departing from the spirit of my invention, and I do not therefore desire to limit myself to the exact form of construction shown and described.

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

1. The combination of an oscillatory counter-balanced receiver adapted for communication with the return pipe of a steam heating plant and arranged to be moved from one position to another by the accumulation of water therein above a predetermined limit, said receiver having an air vent controlled by a check valve opening toward the outer atmosphere, pumping mechanism, the intake of which communicates with said receiver, said pumping mechanism operating to intermittently empty said receiver, and a controlling device actuated by the receiver for starting and stopping said pumping mechanism.

2. The combination with a counter-balanced oscillatory receiver having an air vent and a check valve therefor opening out to the atmosphere, said receiver being adapted for connection with the return pipe of a steam heating plant and being arranged to be moved from one position to another by the accumulation of water therein above a predetermined limit, of pumping mechanism, the intake of which communicates with said receiver through a part of said return pipe, a check valve opening toward the pumping mechanism, and interposed in the return pipe between the receiver and pumping mechanism, and a controlling device actuated by the receiver for starting and stopping said pumping mechanism.

3. The combination of an oscillatory counterbalanced receiver, having an outwardly opening air vent and arranged to be moved from one position to another by the accumulation of water therein beyond a predetermined limit, a return pipe communicating with said receiver through a branch, an intermittently operating pump communicating with said return pipe, and operating to empty the receiver, and a controlling device actuated by said receiver for starting and stopping said pump; said return pipe having check valves opening toward the pump and located on each side of its point of communication with the receiver, said return pipe having also a valve controlled by-pass around the check valve between the receiver and pump.

4. The combination of a receiver, arranged to receive water of condensation, and having an air vent controlled by an outwardly opening check valve, a return pipe communicating with said receiver, and having two sections out of direct communication with each other, one section continuously opening directly into said receiver, and arranged to deliver water to the same and the other section continuously opening directly out from the receiver and arranged to conduct water away therefrom, pumping mechanism interposed in the second named section of the return pipe and operating to intermittently empty said receiver, and controlling mechanism actuated by the rise and fall of water in said receiver for starting and stopping said pumping mechanism.

5. The combination with a receiver, arranged to receive water of condensation, and having an air vent controlled by an outwardly opening check valve, a return pipe communicating with said receiver, and having a section for delivering water to said receiver and a section for conducting water away from said receiver, pumping mechanism interposed in the second named section of said return pipe and operating to intermittently empty said receiver, said pumping mechanism having associated therewith a check valve opening away from the receiver, a valve can rolled bypass included in the return pipe and extending around said check valve, and controlling mechanism actuated by the rise and fall of the water in the receiver for starting and stopping the pumping mechanism.

In witness whereof, I have hereunto signed my name at Chicago, Cook county, Illinois, this 18th day of November 1910.

AUGUSTUS C. DURDIN, Jr.

Witnesses:

CHARLES O. SHERVEY,
FANNIE F. RICHARDS.