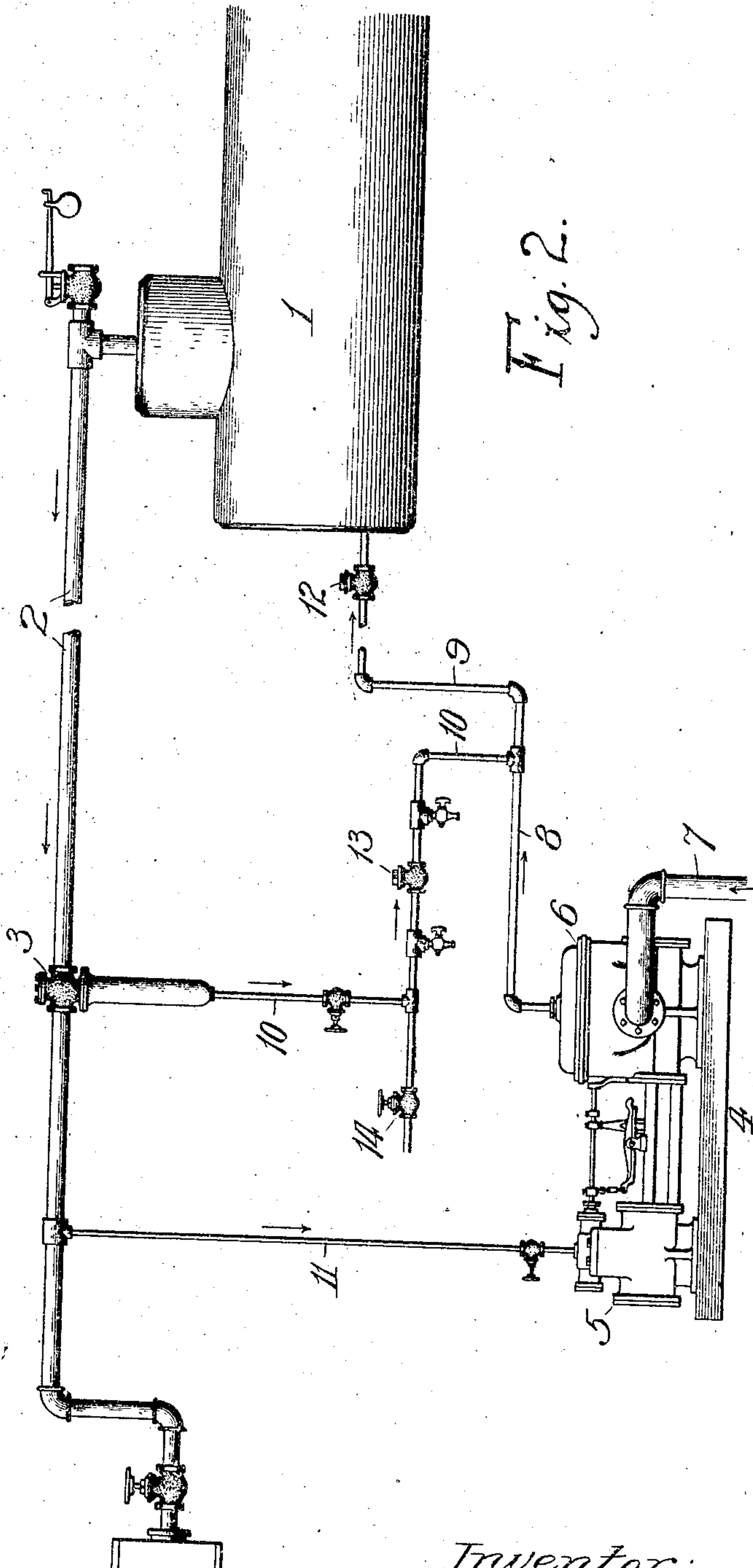
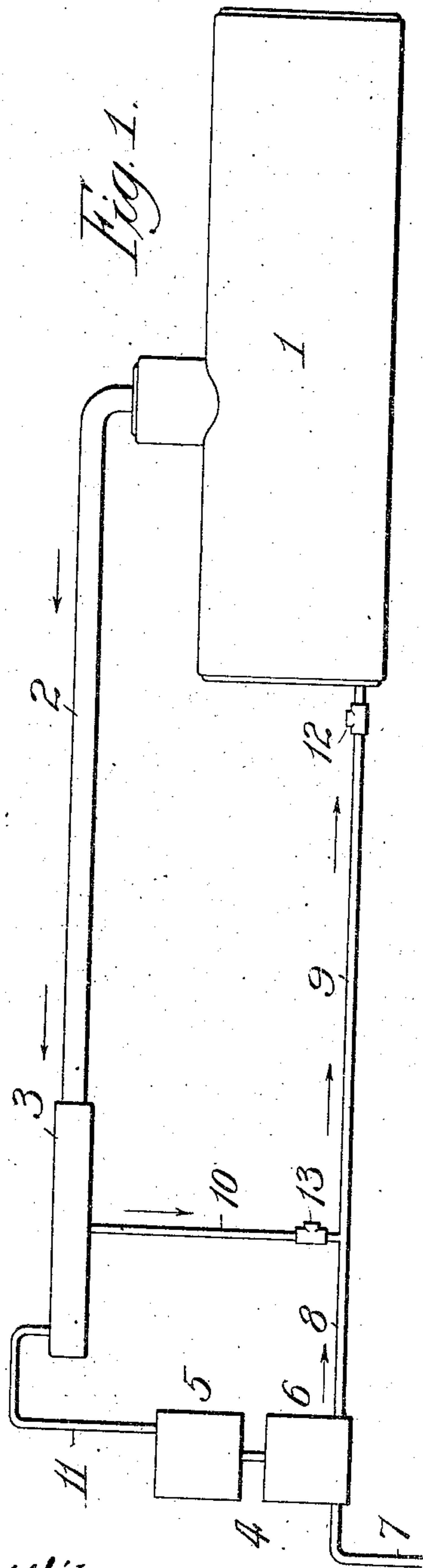


No. 870,658.

PATENTED NOV. 12, 1907

W. H. ZIMMERMAN.  
SYSTEM OF DRIP WATER RETURN.

APPLICATION FILED OCT. 24, 1906.



Witnesses:  
C. C. Gaylord.  
John Enders.

Inventor:  
Walter H. Zimmerman,  
By Kempster B. Miller  
Att'y



# UNITED STATES PATENT OFFICE.

WALTER H. ZIMMERMAN, OF DE KALB, ILLINOIS.

## SYSTEM OF DRIP-WATER RETURN.

No. 870,658.

Specification of Letters Patent.

Patented Nov. 12, 1907.

Application filed October 24, 1906. Serial No. 340,265.

To all whom it may concern:

Be it known that I, WALTER H. ZIMMERMAN, a citizen of the United States of America, and a resident of De Kalb, county of De Kalb, and State of Illinois, have invented a new and useful Improvement in a System of Drip-Water Return, of which the following is a specification.

My invention relates to drip connections for steam pipes, and has for its object an arrangement of piping whereby the drip from the various steam pipes, however collected, will be automatically returned to the boiler without the necessity of special pumping or equivalent apparatus. I accomplish this result not only automatically but also immediately, and as a result the water of condensation is returned to the boiler by the most direct path, practically as soon as it is formed in the various portions of the steam pipe. It is thus returned to the boiler with very little loss of heat and a consequent gain of efficiency is the result.

My invention is based on the fact that in steam plants where ordinary reciprocating pumps are used for feeding water to the boilers, there is an intermittent reduction of pressure below that of the boiler pressure in the feed water pipe leading from the pump to the boiler. This is due to the intermittent action of the pump and to the inertia of the water in the pipe. There is always practically boiler pressure in the vessel or pipe containing the water of condensation or drip, and from this it follows that at certain periodic intervals while the feed pump is operating, there will be a higher pressure in the drip pipe than in the feed water pipe. I make use of this fact by piping from the various low points of the steam mains to the feed water pipe, preferably at a point nearer to the pump than to the boiler.

In this drip pipe I place a check valve so connected as to allow water to flow toward the boiler but not in the reverse direction. Since there is always full steam pressure upon the water in the drip pipe and at intermittent intervals less than steam pressure in the feed water pipe, it follows that at these intervals there will be a flow of water from the drip connection to the feed water pipe through the check valve. The water of condensation is thus at every stroke of the pump fed to the boiler with the main supply of feed water and this without going through any other apparatus than a check valve and necessary pipes. The result is therefore accomplished automatically and with a minimum loss of heat of the water of condensation and a consequent gain of efficiency of the steam plant as a whole.

My invention is particularly illustrated in the accompanying sheet of drawings, in which

Figure 1 is a simplified diagram of the piping intended to illustrate the principles involved in my invention; Fig. 2 is a more complete diagram of piping,

this showing such an actual arrangement of pipe, valve and other apparatus as may be employed in carrying out my invention in practice.

In referring now more particularly to Fig. 1, 1 is a boiler, and 2 a steam pipe leading therefrom to a header 3, from which connections are made to the steam engines and to the steam connections of the feed pumps; 4 is a steam pump, of which 5 is the steam cylinder and 6 is the water cylinder; 7 is the water-supply pipe, 8-9 the feed pipe leading from the feed pump and boiler, and 10 the drip pipe for carrying the water of condensation from the header 3 into the feed pipe 8-9; check valves are shown at 12 and 13.

It is found in practice that after each stroke of the feed pump 4, the drip water flows from pipe 10 through check valve 13 into the feed pipe 8-9, and hence the succeeding stroke of the feed pump carries the drip water into the boiler 1. This action may be explained by a study of the momentum of the water in its course through the feed pipe 8-9, and the resultant pressure under the intermittent action of the feed pump 4. The stroke of the piston of the feed pump forces water through the feed pipe 8-9 at a comparatively high speed; the stopping of the piston head does not stop the column of water flowing through the feed pipe 8-9, the stoppage of that column being effected only by the back pressure of the steam in the boiler, by the net weight of the water being lifted, and by the friction of the water upon the pipes. This is similar to the action of the well-known hydraulic ram, and after the completion of the stroke of the feed pump 4, water will continue to flow up the supply pipe 7, through the feed pump 4, and through the feed pipe 8-9 and check valve 12, until the causes enumerated stop the flow. If, now, a sufficient momentum exists in pipe 9 to cause water flow through check valve 12 after the completion of the stroke of feed pump 4, then the drip water in pipe 10 will obtain precedence over the water in pipe 8 by reason of the steam pressure behind the water in the pipe 10, and as a consequence water will flow from pipe 10 through the check valve 13, and this after every stroke of the pump 4, thus keeping the drip pipe 10 drained so long as pump 4 is running.

In Fig. 2 are shown also valves and pet cocks for control of the various parts of the drip-return system, and also alternative drip-disposition facilities for use when the pump 4 is not running, viz: the valve 14, whose outlet pipe may lead to a hot well or to a sewer.

The drip pipe 10 should tap all points of the steam distribution system where drip water is likely to collect. The pipe 10 joins the pipe 8-9 preferably as near to the pump 4 as convenient.

I do not wish to limit myself in all respects to the details herein shown and described.



Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In a drip water return system, a steam boiler; a  
5 steam pipe; an intermittently acting feed pump; a feed  
pipe connecting said pump and boiler; and a drip pipe  
connecting said steam pipe and said feed pipe and having  
a check valve, substantially as described.
2. In a drip water return system, a steam boiler; a  
10 steam pipe; an intermittently acting feed pump; a feed  
pipe connecting said pump and boiler; a drip pipe connect-  
ing said steam pipe and said feed pipe and having a check  
valve; and entering said feed pipe at a point remote from  
said boiler, substantially as described.
- 15 3. In a drip water return system, a steam boiler; a  
steam pipe; an intermittently acting feed pump; a feed  
pipe connecting said pump and said boiler; a collector  
chamber wherein drip water may collect and be retained  
under steam pressure; and a connecting pipe whereby the  
20 collected drip water may drain into said feed pipe when  
the pressure in said feed pipe falls below the steam pres-  
sure, substantially as described.
4. In a drip water return system, a steam boiler; a  
steam pipe; an intermittently acting feed pump; a feed  
25 pipe connecting said pump and said boiler; a collector  
chamber wherein drip water may collect and be retained

under steam pressure; and a pipe having a check valve  
and connecting with said feed pipe, substantially as de-  
scribed.

5. In a drip water return system; a steam boiler; a 30  
steam pipe; an intermittently acting feed pump; a feed  
pipe connecting said pump and said boiler; a collector  
chamber wherein drip water may collect and be retained  
under steam pressure; and a pipe having a check valve  
and connecting with said feed pipe at a point remote from 35  
said boiler, substantially as described.

6. In a drip water return system, a steam boiler; a feed  
water pipe; a drip water pipe adapted to hold water of  
condensation and under the steam pressure of said boiler 40  
and to permit the flow of the water of condensation into  
said feed water pipe when the water pressure in said feed  
water pipe at the point of connection with said drip water  
pipe is less than the steam pressure in said steam boiler; a  
check valve in said drip pipe; and means for varying the 45  
water pressure in said feed water pipe above and below the  
steam pressure in said steam boiler, substantially as de-  
scribed.

Signed by me at De Kalb, county of De Kalb and State of  
Illinois, in the presence of two witnesses.

WALTER H. ZIMMERMAN.

Witnesses:

E. J. TERWILLIGER,  
F. O. CRUPS.