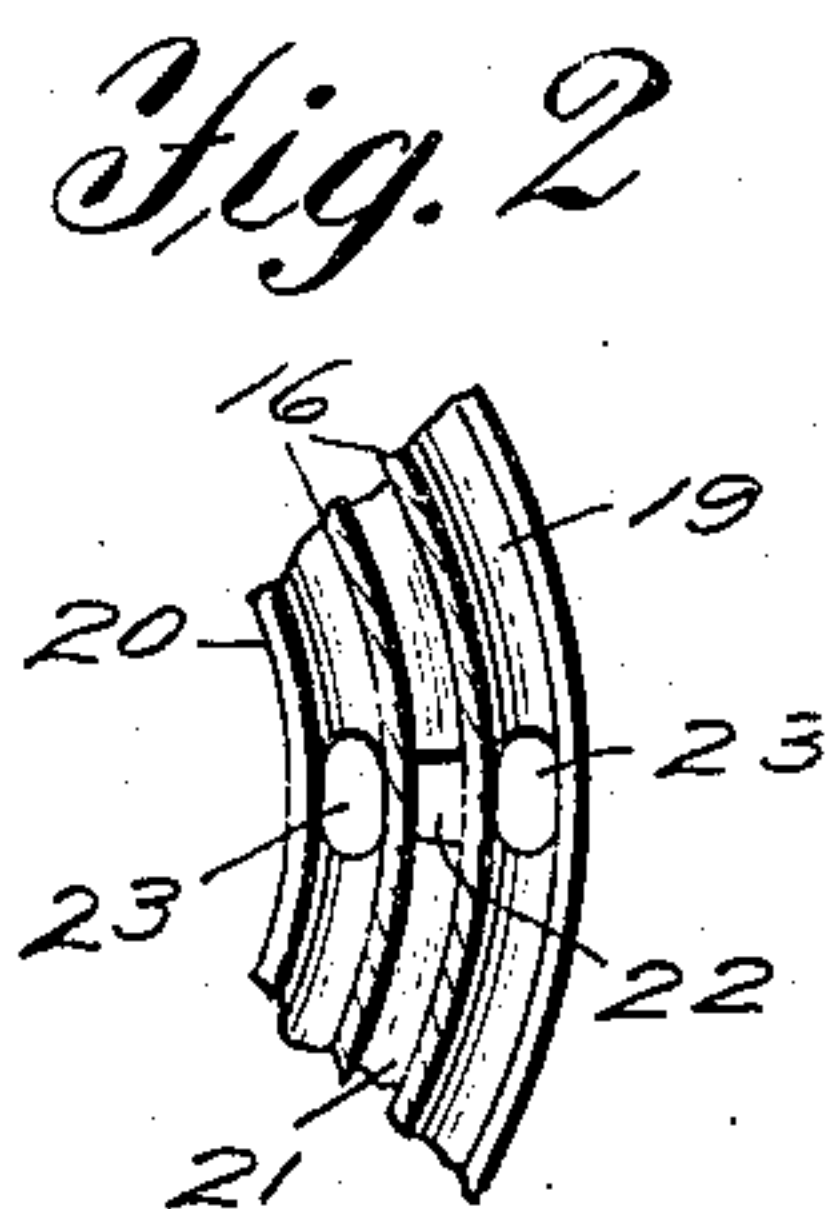
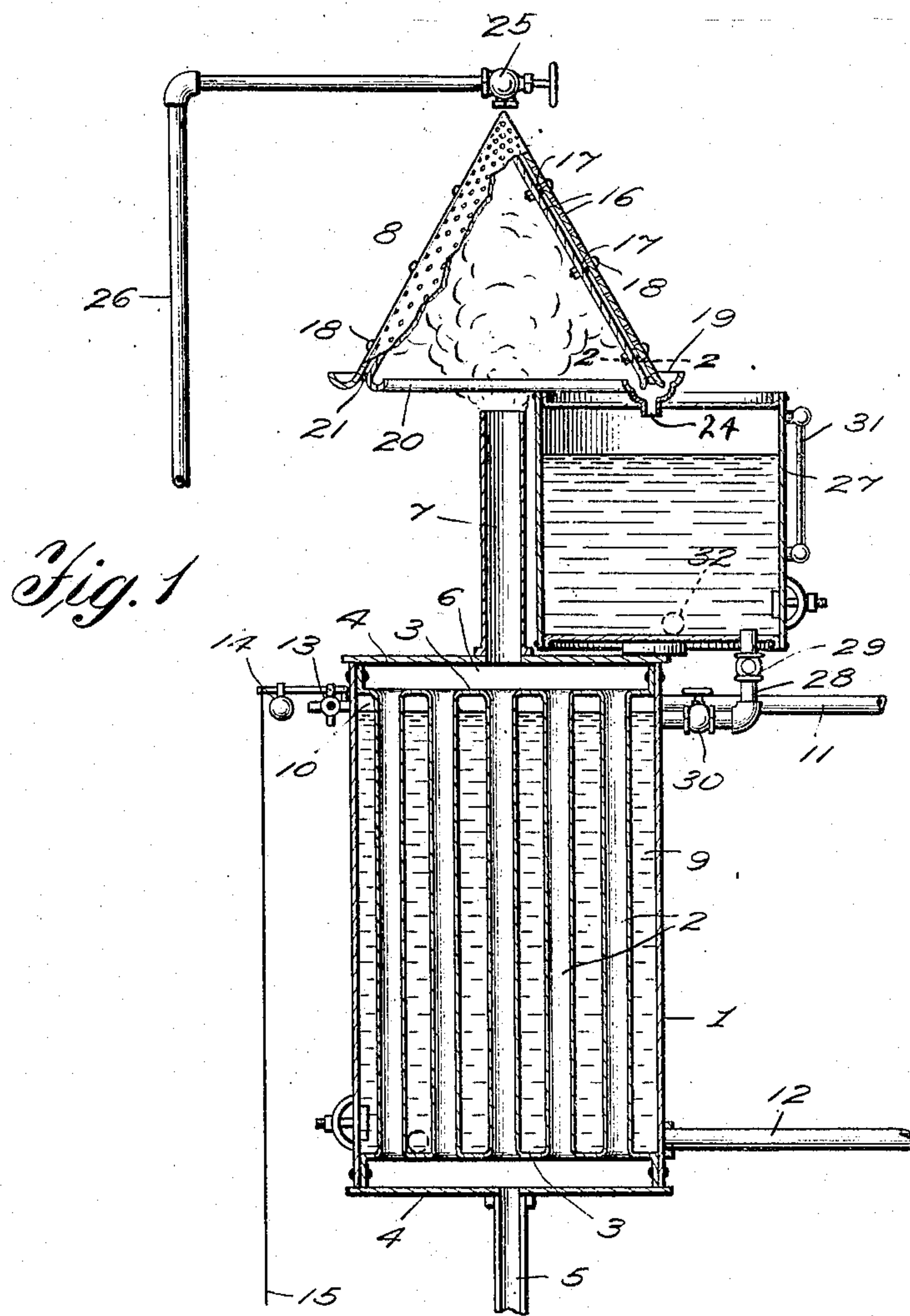


W. A. MOFFAT.  
CONDENSER.

APPLICATION FILED MAR. 8, 1907. RENEWED MAR. 12, 1909.

923,684.

Patented June 1, 1909.



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# UNITED STATES PATENT OFFICE.

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## CONDENSER.

No. 923,684.

Specification of Letters Patent.

Patented June 1, 1909.

Application filed March 8, 1907, Serial No. 361,329. Renewed March 12, 1909. Serial No. 483,027.

*To all whom it may concern:*

Be it known that I, WALTER ANDREW MOFFAT, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented new and useful Improvements in Condensers for Steam Systems, of which the following is a specification.

This invention relates to a combined atmospheric and water condenser of that type employed in connection with an exhaust heater and is designed for use more particularly with feed water heaters such as that disclosed in the United States Letters Patent No. 822,972, granted to me on the 12th of January, 1906, although the present invention is not necessarily limited to this use.

The invention has for one of its objects to improve and simplify the construction and operation of apparatus of this character so as to be comparatively easy and inexpensive to manufacture, thoroughly reliable and efficient in use and readily controlled.

A further object of the invention is to provide a condenser of simple form adapted to receive the exhaust steam after passing through the exhaust heater for the feed water; the steam being acted upon by the atmosphere and cooling water in such a manner that practically all the steam is condensed and collected.

Another object of the invention is the employment of a tank for receiving the water of condensation and the cooling water, the said tank being arranged above the exhaust heater so as to discharge into the heater to which it is connected by a pipe having a check valve that opens toward the heater when the tank becomes filled.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawing, which illustrates one of the embodiments of the invention. Figure 1 is a vertical section of the ap-

paratus. Fig. 2 is a horizontal detail sectional view on line 2—2, Fig. 1.

Similar reference characters are employed to designate similar parts throughout the several views.

Referring to the drawing, 1 designates the cylindrical casing of an exhaust heater in which are arranged a plurality of flues or tubes 2 connected with plates 3 disposed inwardly from the heads 4 on the cylinder 1. The exhaust steam from the engines or other apparatus is received from a pipe 5 connected with the bottom head 4 of the exhaust heater and the steam passes upwardly through the flues 2 to the exhaust steam space 6 and thence through the discharge pipe 7 to the condenser designated generally by 8, the water of condensation being carried off by means of a drip pipe in head 4. The body of water 9 in the heater is raised in temperature by the exhaust steam. Above the body of water 9 is a steam space 10 that is adapted to be connected by an equalizing pipe 11 with the steam space of the tank of the feed water heater disclosed in the Letters Patent hereinbefore referred to and the lower end of the cylinder 1 is connected by a water discharging pipe 12 with the said feed water heater so as to feed the boiler with which the apparatus is used. By this arrangement, the water from the exhaust heater 1 will flow by gravity to maintain the supply in the boiler. Connected with the steam space 10 of the exhaust heater is a safety valve 13 having a weighted lever 14 that has connected therewith a rope 15 or equivalent means whereby the attendant can open the valve at will and thereby rendering the apparatus a closed or open heater.

The condenser 8 comprises a pair of metallic cones 16 that may be made of perforated material or screening of suitable mesh so that cooling water can be discharged upon the outer cone without danger of dropping vertically through the perforations. These cones are slightly spaced apart by washers 17 on bolts 18 and the lower ends of the cones are formed into annular eave



troughs 19 and 20, the latter being arranged internally so as to collect the water flowing down on the internal surface of the cone. In order to prevent the water from flowing out between the cones, a ring 21 is secured between the cones adjacent the troughs and this ring has an opening 22, as shown in Fig. 2, for permitting the water to discharge. Each trough has an opening 23 arranged adjacent the opening 22 and a common spout 24 is employed to convey away the cooling water and the water of condensation. Disposed above the apex of the cones is a globe valve 25 connected with a water supply pipe 26, whereby water is evenly distributed from the outer cone 16.

Supported on the exhaust heater and disposed between the same and the condenser is a water tank 27 of any suitable capacity that receives the water discharged through the spout 24, and the bottom of the tank 27 is connected with the casing 1 below the normal water line by a pipe 28 in which is arranged a check valve 29 that opens toward the exhaust heater and closes toward the tank 27, and also included in the pipe 28 is a hand-operated shut-off valve 30. The tank 27 may be provided with a sight glass 31 if desired and the blow-off pipe 32 is connected with the bottom of the tank.

From the foregoing description, taken in connection with the accompanying drawing, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains.

In operation, the exhaust heater is supplied with water and placed under steam pressure through the pipe 11 and the steam from the engine or other apparatus is conveyed to the heater so as to raise the temperature of the water therein and after passing through the heater, the exhaust steam discharges into the condenser 8 where it is acted upon by the atmosphere and also by the sheet of water flowing down over the outer cone of the latter, and since the cones of the condenser are perforated, the steam is exposed to this water so that the condensing of the steam is effectually accomplished. The supply of cooling water is so regulated as to make up for the losses in the system, due to evaporation, and this water collects in the trough 19, while the water of condensation collects in the trough 20 and from both troughs the water collects in the tank 27. When the tank becomes filled, the weight of the water will cause the check valve 29 to open, assuming that the cut-off valve 30 is open, so that the water will flow into the exhaust heater. To assist this discharge from the tank, the safety valve 13 may be opened by the attendant, whereby the pressure in the exhaust heater is relieved.

I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, but I desire to have it understood that the apparatus shown is merely illustrative and that such changes may be made when desired, as are within the scope of the claims.

Having thus described the invention, what I claim is:—

1. In an apparatus of the class described, the combination of an exhaust heater consisting of a steam-tight chamber having flues extending therethrough, means for discharging steam to the bottom of the heater, a pipe permanently open to the atmosphere and connected with the top of the heater for receiving the steam after passing through the flues, an atmospheric condenser located above the pipe and open at its bottom to receive the steam from the latter, means on the condenser for collecting the water of condensation, a tank disposed below the condenser, means for draining the water of condensation by gravity into the tank at the top thereof, and means for discharging water from the tank by gravity from the bottom of the tank to the heater.

2. In an apparatus of the class described, the combination of an exhaust heater, a discharge pipe delivering steam freely into the atmosphere, a condenser disposed directly above the pipe to receive the steam from the latter, means on the condenser for collecting the water of condensation, means arranged to discharge cooling water on the outside of the condenser, a tank supported above the heater and below the condenser, a common device for delivering steam and cooling water to the top of the tank, and a controllable connection between the bottom of the tank and top of the heater.

3. A condenser comprising two nested cones of perforated sheet metal having their lower edges bent respectively into internal and external troughs, in combination with means for discharging cool water upon the exterior of the outer cone.

4. A condenser comprising two closely nested cones of sheet metal through which steam and water pass; devices for securing the cones together and supporting one on the other, spacing means between the cones and mounted on the devices, and internal and external troughs on the bottom of the condenser.

5. In an apparatus of the class described, the combination of an exhaust heater, means connected with the bottom of the heater for supplying exhaust steam thereto, a discharge pipe at the top of the heater, an atmospheric condenser disposed above the pipe and spaced therefrom, means above the condenser for discharging cooling water upon the same, a



tank intermediate the condenser and heater  
and supported on the latter and supporting  
the condenser, means for delivering cooling  
water and water of condensation to the tank,  
5 a pipe between the bottom of the tank and  
top of the heater, a check valve in the pipe  
opening toward the heater, a cut-off valve in  
the pipe between the check valve and heater,

and a safety device connected with the steam  
space of the heater.

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

WALTER ANDREW MOFFAT.

Witnesses:

DAVID B. GRAHAM,  
KATHARINE GRACE.