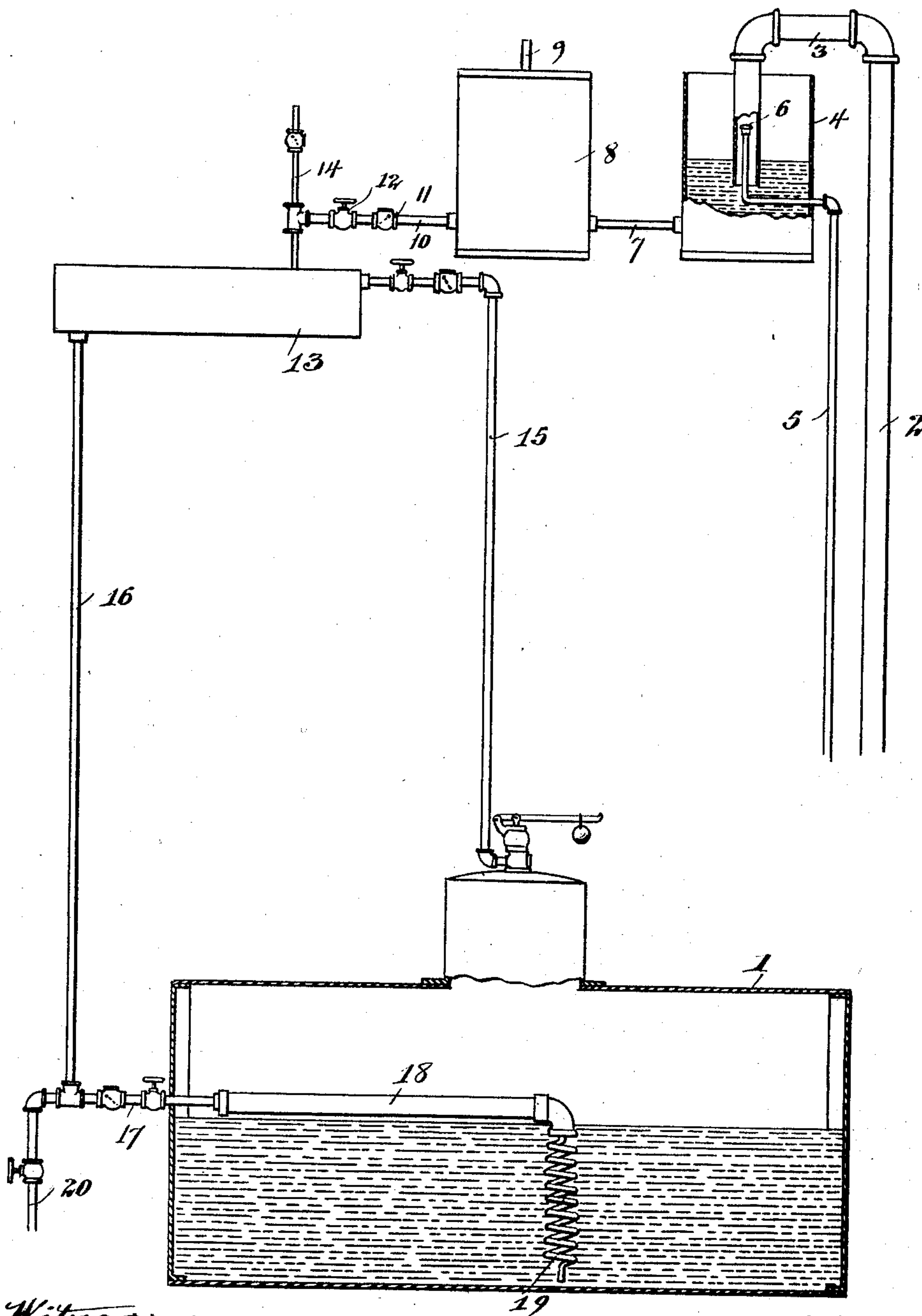


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STEAM CONDENSER.  
APPLICATION FILED AUG. 1, 1901.

NO MODEL.



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# UNITED STATES PATENT OFFICE.

WILLIAM IRVING, OF CHICAGO, ILLINOIS.

## STEAM-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 719,671, dated February 3, 1903.

Application filed August 1, 1901. Serial No. 70,505. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM IRVING, of Chicago, Illinois, have invented certain new and useful Improvements in Steam-Condensers, of which the following is a specification.

This invention relates to an apparatus for condensing the exhaust-steam from steam-boilers, whereby the water of condensation may be returned to the boiler at such temperature as to effect a material economy of fuel.

The apparatus is represented in the accompanying drawing, which is a diagrammatic view, partly in elevation and partly in section.

In the drawing, 1 represents a steam-boiler, and 2 the exhaust-steam pipe. The latter is provided at its upper end and preferably at a considerable elevation with an elbow 3, the lower end of which opens within a condenser 4. A small pipe for delivering cold water (marked 5) is carried through the wall of the condenser 4 and has an upturned portion terminating in a jet-nozzle 6 within the hollow of the depending portion of the elbow of the exhaust-steam pipe. From the condenser a connection is made by the pipe 7 to the tank 8, which may be closed, except for the provision of an air-vent 9 at its top. The condenser 4 is open at its upper end. From the tank 8 a water connection is made through the pipe 10, provided with a check-valve 11 and globe-valve 12, to the reservoir 13, and a vent-pipe 14 leads from a coupling on the pipe 10, the reservoir 13 being otherwise closed. A steam-pipe 15, led from the dome of the boiler and provided with suitable valves, is carried into the reservoir near its upper side, and a water-return pipe 16 leads from the opposite end of the reservoir down to a point just above the water-level of the steam-boiler and is provided with a branch 17, which extends through the head of the boiler and connects with an enlarged pipe 18, lying just above the water-level in the boiler and terminating in a coil 19 of small diameter, which delivers near the bottom of the boiler. The air-vent pipe 20, provided with a cock, is connected into the end of the pipe 17.

The apparatus as thus constructed operates in the following manner: Exhaust-steam passing upwardly through the pipe 2 and

around through the elbow 3 is delivered into the condenser-tank 4 below the water-level therein and is condensed by means of the spray of water issuing through the jet-nozzle 6. Only a sufficient quantity of cold water is supplied to effect condensation, but not sufficient to reduce the temperature of the water much below the point of condensation. The water standing in the condenser will therefore be hot, and it will flow by reason of the head maintained into the tank 8 and thence through the connections into the reservoir 13, from whence it will be discharged by the live steam delivered through pipe 15 into the upper portion of said reservoir, thus forcing the water to descend the pipe 16 and enter the boiler, the water returning to the boiler heated to approximately the boiling temperature by means of the coil 19.

In setting the apparatus in operation the cock in the vent-pipe 20 will be open, so that the pressure will expel the air in the system below the steam connection through pipe 15, and any air which would tend to prevent the flow of the water into the tank 8 and reservoir 13 will find escape through the vents 9 and 14. The tank 8 might be omitted; but it may be used for storage, and for that purpose the connection 10 is provided with the globe-valve 12.

The purpose of this invention is to save fuel by condensing the exhaust-steam in such a way as to return the water of condensation to the boiler at an elevated temperature, thereby saving the heat units which would be necessary to raise water from the normal temperature to the temperature of the water of condensation. In practical tests this saving has been demonstrated to be very considerable. The exact arrangement of the apparatus may be considerably varied; but the form shown has been found efficient in practice. The use of steam for driving the water into the boiler forms no part of the present invention and may be obviated if a sufficient head of water is maintained to overcome the steam-pressure or if the reservoir be heated.

I claim—

1. An apparatus for condensing exhaust-steam, comprising in combination a condenser-tank open at its upper end and normally containing a body of condensing liquid therein,

100



an exhaust-pipe the open end of which extends through the open end of said condenser-tank and below the normal level of the liquid therein, and a cold-water-injection pipe  
5 extending upwardly within the open end of the exhaust-pipe and terminating in a spraying-nozzle, substantially as described.

2. An apparatus for condensing exhaust-steam, comprising in combination a condenser-  
10 tank normally containing a body of condensing liquid therein, a steam-exhaust pipe the

discharging end of which extends downwardly into said condenser-tank, and a cold-water-injection pipe tapping the condenser-tank and extending upwardly within the open end  
15 of the exhaust-pipe and terminating in a spraying-nozzle, substantially as described.

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