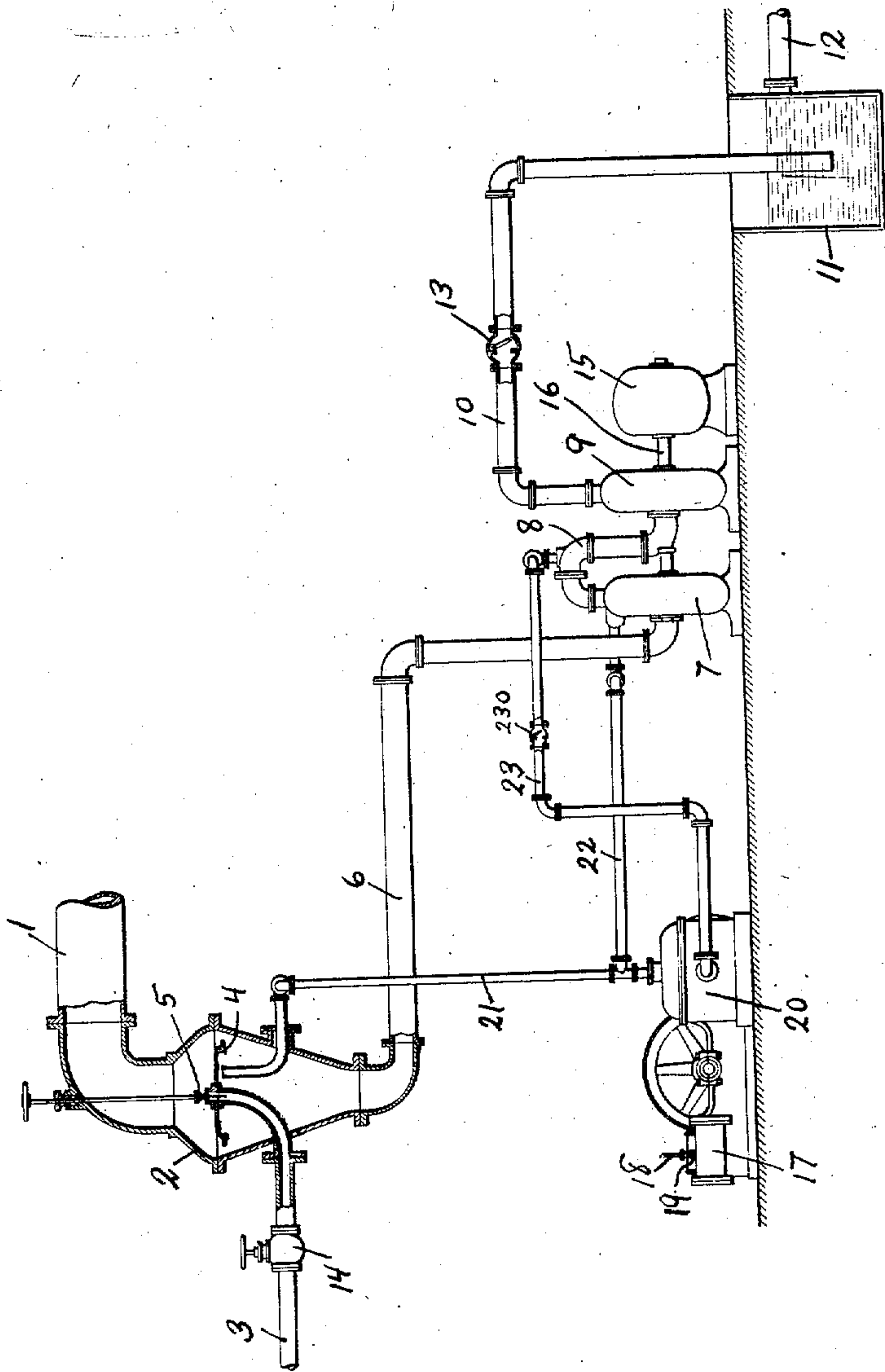


No. 863,116.

PATENTED AUG. 13, 1907.

R. D. TOMLINSON.  
CONDENSER PLANT.  
APPLICATION FILED MAR. 27, 1907.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## CONDENSER PLANT.

No. 863,116.

Specification of Letters Patent.

Patented Aug. 13, 1907.

Application filed March 27, 1907. Serial No. 364,813.

*To all whom it may concern:*

Be it known that I, ROYAL D. TOMLINSON, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Condenser Plant, of which the following is a specification.

This invention relates to condenser plants and is adapted for use either with a surface or a jet condenser, the specific organization of plant disclosed by this specification and the drawings accompanying the same is, however, specifically designed for use with a jet condenser.

Briefly stated, the condenser plant which constitutes the subject-matter of this invention comprises the combination with a jet condenser of water and air pumps for relieving the condenser head of the condensing water and the water of condensation and for freeing the condenser head of air and other gases while at the same time freeing from air one of the water pumps employed in order that it may not become air bound.

It is a well known fact that air carried into a jet condenser with the condensing water increases in volume enormously by expansion due to the diminished pressure within the condenser and separates from the water. The air thus liberated must be removed by special apparatus in order to prevent the vacuum in the condenser from being destroyed. Many forms of apparatus have been devised for this purpose and some of them are very successful in practice.

This invention specifically deals with the problem where it is desirable to use a jet condenser and on account of location or natural conditions it is not possible to have a tail pipe 34 feet high (or whatever the barometric column may be for a specific locality) between the head of the condenser and the surface of the water in the hot well. Under these circumstances a pump or pumps must be employed to discharge the water from the condenser against the atmospheric pressure which must be overcome, and in practice it is found preferable to use two or more pumps arranged in series on account of the efficiency of operation resulting from such an arrangement.

This invention specifically combines two centrifugal or positive rotary pumps arranged in series and connected with the condenser, a separate dry air pump being provided to free the condenser of air, said dry air pump also being connected with the pump located nearer the condenser to free that pump of air, a discharge for the dry air pump being provided at a point preferably between the impellers of the two pumps, whereby the back pressure upon the dry air pump is diminished to the pressure which exists between the two impellers, which pressure is less than atmospheric, as the work of forcing the water from a vacuum into the

atmosphere against the pressure of the atmosphere is 55 divided between two impellers or pumps, each of which performs a part of the work.

Referring to the drawing which accompanies this specification and forms a part thereof, the figure illustrates diagrammatically and partially in section a con- 60 denser plant embodying this invention.

Referring to the drawing, the numeral 1 designates the exhaust steam pipe leading from the engines or other steam-using apparatus, not shown; 2 designates the jet condenser head; 3 the cold water or condensing 65 water pipe; 4 the umbrella located within the condenser head; 5 the condensing water controlling valve; 6 the tail pipe through which the condensing water and the water of condensation is discharged; 7 a centrifugal or rotary pump with which the tail pipe 6 connects; 8 70 the discharge pipe or conduit from said rotary pump, which in turn becomes the supply pipe or conduit for the second centrifugal or rotary pump 9; and 10 the discharge pipe from said second rotary pump, which is extended below the surface of the water contained in the 75 hot well 11.

The hot well 11 may be provided with the overflow pipe 12, which may lead to waste or to a tank from which the water may be returned again to the boilers.

The condenser plant shown being adapted for use 80 with a variety of plants, the illustration is limited to the condenser plant alone, no other parts referred to being shown.

The pipe 10 is provided with a check valve 13, and the pipe 3 is provided with a stop valve 14. 85

The numeral 15 designates an electric motor as a convenient motor for operating pumps 7 and 9, and the drawings illustrate the armature of this motor and the impellers of the pumps as all carried on a common 90 shaft 16.

The numeral 17 designates the steam cylinder of the dry air pump to which steam may be admitted through the pipe 18 and from which the steam is exhausted through the pipe 19, said cylinder being provided with a piston and piston rod which actuate the plunger or 95 piston of the air pump 20, the details not being shown.

The numeral 21 designates the inlet or suction pipe for the dry air pump, which pipe is extended into the condenser head and has its open end located under and adjacent to the umbrella 4, as the air and other gases 100 collect under this umbrella.

The numeral 22 designates a pipe which is connected at the point in pump 7 where air collects and which if not removed would cause said pump to become air bound, and this pipe 22 connects with pipe 21, whereby 105 air would be withdrawn either from the condenser head or from the pump 7, or both.

The numeral 23 designates the discharge pipe from



the air pump 20, which is provided with check valve 230, and this pipe, as previously stated, is preferably arranged so that the discharge is into the pipe 8.

The operation of the apparatus is as follows: Steam 5 being supplied to the condenser head through the exhaust pipe 1, the water which passes into said head through pipe 3 condenses said steam, and this water, together with the water of condensation, is withdrawn from the condenser head by the pumps 7 and 9, operated 10 by the motor 15, and discharged into the hot well 11. Air and other gases are also withdrawn from the condenser head 2 and from the pump 7 by the air pump 20, and discharged into the pipe 8.

It is apparent that by providing the two pumps 7 15 and 9 and the means disclosed for preventing the first pump 7 from becoming air bound, said pump will always provide an efficient water seal for the condenser head 2.

It will also be apparent that the second pump 9 cannot become air bound for the reason that the first pump 20 7 is forcing water to it which will drive out the air which may be in said pump.

By discharging the air from pump 20 into pipe 8, the back pressure on pump 20 is less than atmospheric 25 pressure by the amount of "suction head" created by pump 9.

It will thus be seen that this invention provides an extremely simple, safe and reliable form of apparatus 30 for discharging the water from a condenser under the conditions stated.

Instead of the specific form of two pumps shown by

the drawing, any equivalent structure may be used, the term "pump" as used in this specification and in the claims meaning the forcing or impelling means as distinguished from their inclosing casings. 35

What I claim is,—

1. The combination with a condenser, of a pump for withdrawing water therefrom; a dry air pump for withdrawing air and gases from said condenser, and another pump adapted to receive and discharge the water discharged by the first pump together with the air discharged 40 by said dry air pump.

2. The combination with a condenser, of a pump for discharging water therefrom, a dry air pump for discharging air from said condenser, said dry air pump being 45 also in communication with said first mentioned pump to discharge air from said pump, and another pump adapted to receive the water discharged by said first mentioned pump and the air discharged by said dry air pump and to discharge said water and air to a suitable place. 50

3. The combination with a jet condenser provided with a steam inlet and a water outlet, of a centrifugal pump in open communication with said condenser, a dry air pump provided with a suction pipe extended into said condenser, said dry air pump also being provided with a suction pipe 55 in open communication with the interior of said centrifugal pump, and another centrifugal pump connected with said first mentioned centrifugal pump by a conduit, said dry air pump being provided with a discharge pipe adapted to discharge into said conduit at a point between the two 60 pumps.

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

ROYAL D. TOMLINSON.

Witnesses:

G. F. DE WEIN,  
FRANK E. DENNETT.