R. D. TOMLINSON.

BAROMETRIC CONDENSER.

APPLICATION FILED MAY 20, 1910.

**1,002,814.** **Patented Sept. 5, 1911.**

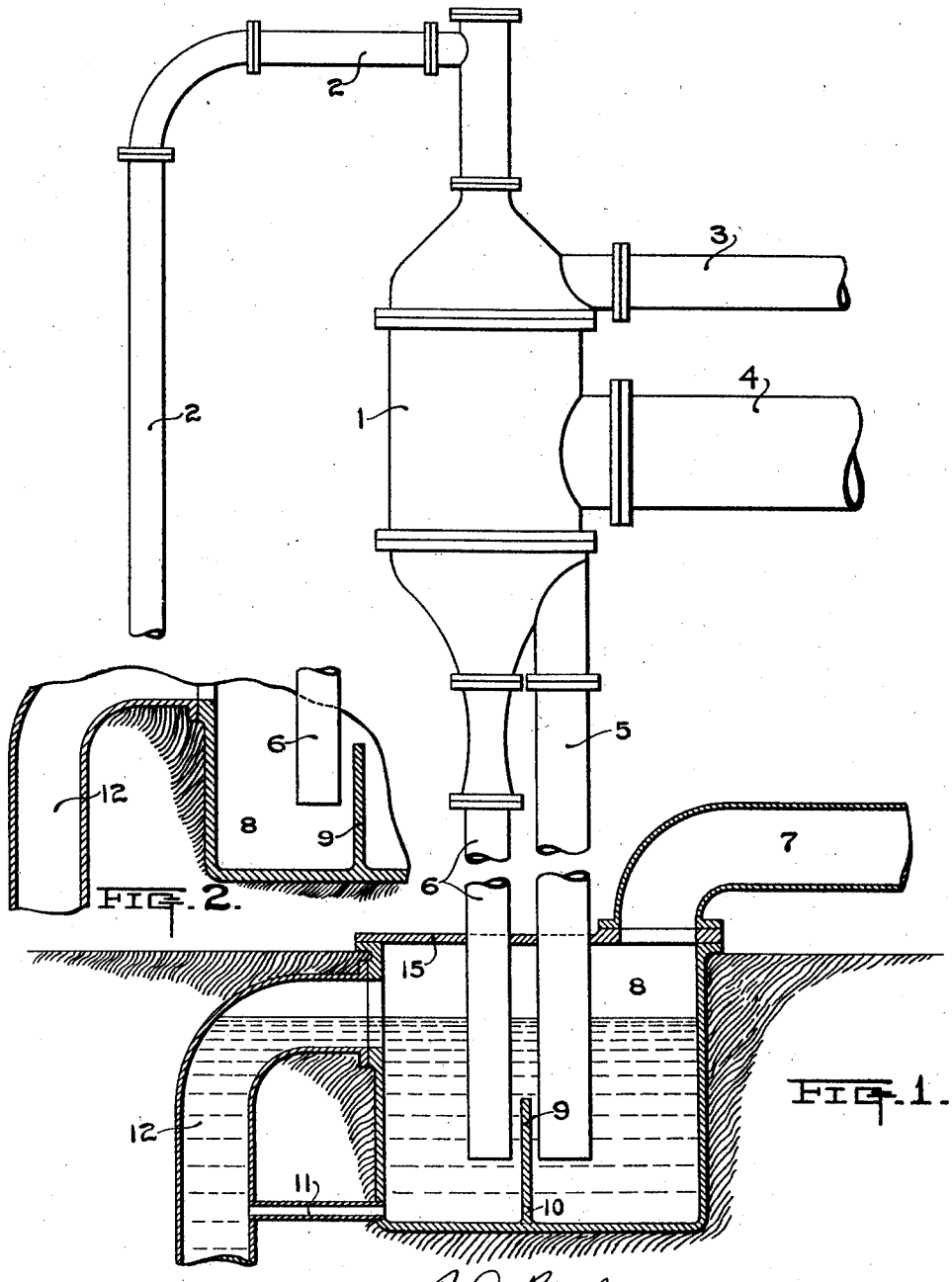


FIG. 2.

FIG. 1.

WITNESSES—

W. H. Lieber.

Ella Brickell

R. D. Tomlinson INVENTOR—

BY G. J. Wilkin

ATTORNEY.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

ROYAL D. TOMLINSON, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ALLIS-CHALMERS COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF NEW JERSEY.

## BAROMETRIC CONDENSER.

1,002,814. Specification of Letters Patent. **Patented Sept. 5, 1911.**

Application filed May 20, 1910. Serial No. 562,430.

*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 Improvement in Barometric Condensers, (Case B,) of which the following is a specification.

This invention relates to improvements in the construction of condensers and has particular relation to that class of condensers known as barometric.

The object of the invention is to provide a simple and effective means for permitting the free passage of exhaust steam through the condenser to the atmosphere, if for any reason, such as failure of the supply of condensing water, the condenser proper should become inoperative.

A clear conception of several embodiments of the invention can be obtained by referring to the accompanying drawing in which like reference characters designate the same or similar parts in the several views.

Figure 1 is a fragmentary elevation of a barometric condenser having the improvement applied thereto, the hot well and the piping discharging therefrom, being shown in section. Fig. 2 is a fragmentary vertical section through the hot well of a barometric condenser, showing another embodiment of the invention.

The condenser head or chamber 1, see Fig. 1, which may be of any desirable interior construction, has the steam inlet pipe 4 and the water inlet pipe 3, leading thereto. The steam inlet pipe 4 is adapted to permit the passage of steam to be condensed from any suitable source, as the exhaust of an engine, to the condenser chamber 1. The water inlet pipe 3 is adapted to admit condensing water to the chamber 1 from any suitable source, not shown. The air discharge pipe 2, which connects with the chamber 1 through the dome thereof, is connected to an air or vacuum pump, not shown, which pump is adapted to withdraw air from the condenser chamber 1.

The tail pipe 6 and overflow pipe 5, extend downwardly from the condenser chamber 1 to within a short distance from the bottom of the hot well 8. These pipes 5, 6, are adapted to discharge water from the condenser chamber 1 to the hot well 8, during normal working of the condenser. The hot well 8 is inclosed on all sides, having a cover 15 provided at its top through which the pipes 5, 6, project. The baffle wall 9 projects upward from the bottom of the hot well 8 to a point intermediate and somewhat above the ends of the pipes 5, 6. A passage or port 10 is formed through the wall 9 near the bottom of the well 8, this port 10 being near one side of the well. The hot well overflow pipe 12 emerges from the hot well 8 near the top thereof, the lowest portion of the overflow opening being considerably above the lower extremities of the pipes 5, 6. The drain pipe 11 connects the bottom of the hot well 8 with the overflow pipe 12 at a point below the ends of the pipes 5, 6. The free exhaust pipe 7 connects the interior of the hot well 8 with the atmosphere.

In the embodiment of the invention disclosed in Fig. 2, the drain pipe 11 has been omitted. The port 10 may also be omitted in the disclosure of Fig. 2, but this is not essential.

During the operation of the condenser, the exhaust steam to be condensed is admitted to the chamber 1 through the steam inlet pipe 4. Condensing water is admitted through the water inlet pipe 3, and upon being sprayed over the entering steam, condenses same. A portion of the air is withdrawn from within the condenser chamber 1, through the air pipe 2, the remaining air being carried away with the water of condensation. After condensation of the steam, the mixture of condensing water and water of condensation is discharged from the chamber 1 through the tail pipe 6 and overflow pipe 5, to the hot well 8. The level of the water in the hot well 8 is maintained slightly above the lowest portion of the opening leading to the overflow pipe 12, by the relatively large volume of water entering the hot well. A small portion of this entering water flows directly to the overflow pipe 12 through the drainage pipe 11, but owing to the relatively great volume of water admitted to the well 8, the major portion thereof must flow off directly through

the pipe 12. The lower extremities of the pipes 5, 6, therefore project a considerable distance below the normal water level in the hot well 8.

During the normal operation of the condenser, the major portion of the air is entrained down the pipe 6 to the hot well 8, by the water passing through the tail pipe 6. The baffle wall 9 prevents possibility of this air returning to the condenser chamber 1 through the overflow pipe 5. The port 10 is formed through the wall 9 at one side of the hot well 8 to prevent air thus admitted to the well from passing through the wall to a point below the discharge of the pipe 5. Any air thus entrained into the hot well 8 rises to the surface of the water in the well and is eventually discharged through the free exhaust pipe 7 to the atmosphere. If, however, the vacuum in the condenser should fail, the water normally filling the pipes 5, 6, will drop to the well 8. The level of the water in the hot well 8 will be gradually lowered by the passage of the water therefrom through overflow pipe 12, the port 10 in the wall 9 and the drainage pipe 11. With the water level reduced below the lower extremities of the pipes 5, 6, the steam admitted to the condenser head 1 through the pipe 4 has a free passage to the atmosphere through the pipes 5, 6, hot well 8 and the free exhaust pipe 7. As the water level in the well 8 is not suddenly reduced, due to the small size of the pipe 11, the ends of the pipes 5, 6, will remain sealed for a short time after the vacuum has failed. During this interval of time the steam admitted to the condenser builds up slightly in pressure until its pressure is such that the steam is forced down to the lower extremities of the pipes 5, 6, against the small head of water in the well 8, being discharged through the water to the air space within the well above the water. The steam thus admitted serves to quicken the lowering of the water level in the well 8 by evaporating a portion of the water.

In the embodiment of the invention shown in Fig. 2, the drainage pipe 11 having been omitted, the operation during failure of the condenser vacuum is as follows: The water in the pipes 5, 6, drops to the well 8, being discharged from said well until its level has reached that of the bottom of the opening which connects with the discharge or overflow pipe 12. The steam pressure in the condenser builds up until it is sufficient to overcome the pressure produced by a head of water extending from the lower extremities of the pipes 5, 6, to the lowest portion of the overflow opening, when the steam is discharged from the lower extremities of the pipes 5, 6, and rises through the water in the hot well 8. Since the volume of water in the hot well 8 is not very great, the continual passage of a relatively large quantity of steam therethrough soon evaporates the water to a level below the extremities of the pipes 5, 6. After this low water level has been established, the steam admitted to the condenser head 1 through the pipes 4, has a free exhaust passage to the atmosphere through the pipes 5, 6, hot well 8 and free exhaust pipe 7.

It might be stated that the failure of the vacuum in a barometric condenser is generally caused by the stopping of the admission of injection water. If the injection water supply does fail, it will be seen that after the water level in the hot well 8 has been once lowered as above described, there will be no refilling of the well above the lower ends of the pipes 5, 6, unless the injection water supply is again established, in which case the condenser is again ready for normal operation. The failure of the air pump would not cause the vacuum to fail, unless a large quantity of air were admitted to the head 1 through the pipe 2, as enough air is ordinarily entrained down the pipe 6 to maintain the condenser vacuum for some time.

It should be noted that this device might easily be used in connection with an engine which may be run either condensing or non-condensing, the only change necessary in the transformation being to either admit or close off the injection water supply.

It should be understood that it is not desired to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

It is claimed and desired to secure by Letters Patent,—

1. In a condenser, a head, a pipe adapted to carry steam from said head, an inclosed hot well adapted to receive steam through said pipe, means for permitting free exhaust of steam from said well to atmosphere, and a plurality of constantly open outlets for water leading off from said well at different levels.

2. In a condenser, a head, a tail pipe connected to said head, an inclosed well at the lower end of said pipe, an outlet for water leading off from said well above the lower end of said pipe, a second constantly open outlet for water leading off from said well below the lower end of said pipe, and a free exhaust leading from said well to atmosphere.

3. In a condenser, a head, a tail pipe communicating with said head, a well inclosing the lower end of said pipe, an outlet for water leading off from said well above the lower end of said pipe, a second constantly open outlet for water of relatively much smaller capacity than said first outlet leading off from said well below the lower end

of said pipe, and a free exhaust leading from said well to atmosphere.

4. In a condenser, a head, a pipe communicating with said head, a well inclosing the lower end of said pipe, an outlet for water leading off from said well above the lower end of said pipe, and a second constantly open outlet for water leading off from said well below the lower end of said pipe.

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

ROYAL D. TOMLINSON.

Witnesses:

H. C. CASE,

G. F. DE WEIN.