R. D. TOMLINSON.

STEAM CONDENSER.

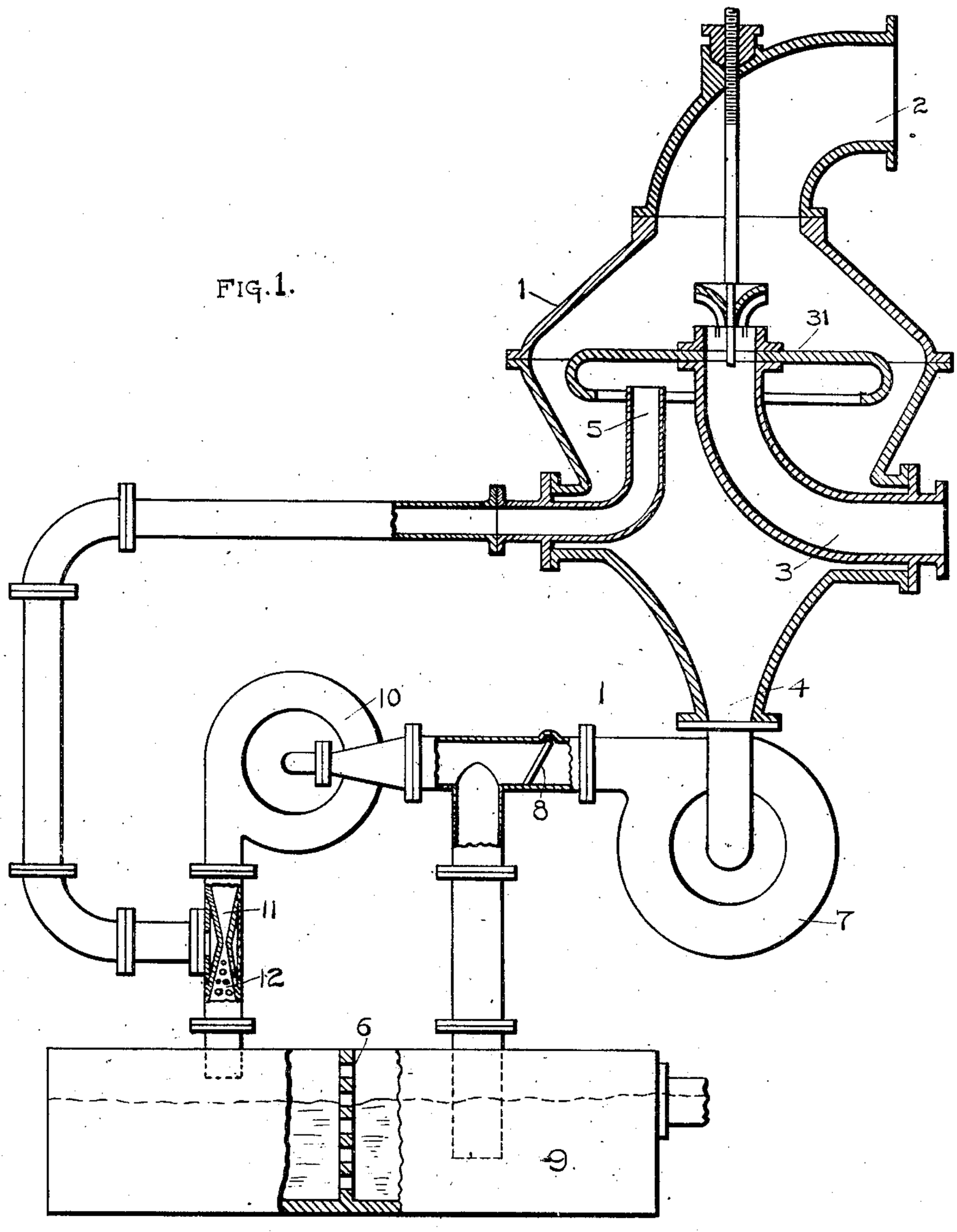
APPLICATION FILED AUG. 29, 1908.

940,648.

Patented Nov. 16, 1909.

2 SHEETS—SHEET 1.

FIG. 1.



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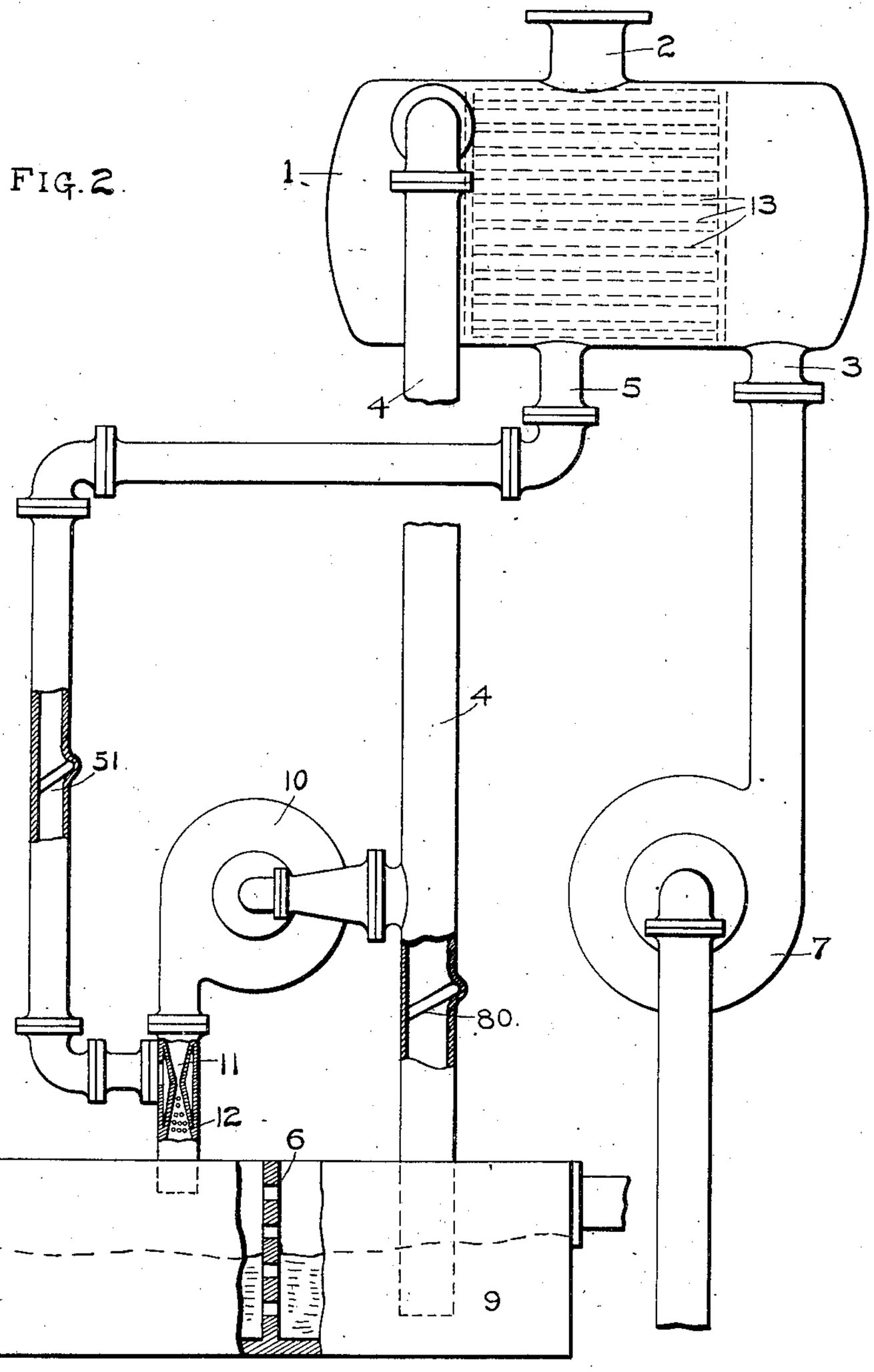
2 SHEETS—SHEET 2.

FIG. 2.



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UNITED STATES PATENT OFFICE.

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

STEAM-CONDENSER.

940,648. Specification of Letters Patent. Patented Nov. 16, 1909.

Application filed August 29, 1908. Serial No. 450,874.

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 Steam-Condensers, of which the following is a specification.

This invention relates to steam condensers and has for its object to produce a more efficient condensing system.

The improvement applies to that class in which a special passage is used to abstract air and prevent it from accumulating in the upper portion of the condenser, thus contributing to the completeness of the vacuum. By means of the arrangement herein shown and described, this air is effectively removed while at the same time a means is provided for automatically breaking the vacuum in case part of the apparatus should fail to operate. A secondary pump used for the removal of the air is so arranged that it greatly increases the efficiency of the system, since its suction takes its supply from the primary pump discharge and therefore all of the water need not be raised to the higher pressure of the secondary pump discharge.

Referring to the accompanying drawings,—Figure 1 is a vertical section of a barometric condenser system. Fig. 2 is an elevation partly in section of a surface condenser system.

Referring to Fig. 1, the steam admission pipe 2 leads into the top of the condenser 1. The water inlet pipe 3 leads into the condenser 1 and terminates in an umbrella 31. The condenser discharge 4 passes to the suction of pump 7. An air discharge pipe 5 has its inlet well up under the umbrella 31 within the condenser 1, passes through the wall of the condenser and terminates annularly about a nozzle 11 in the discharge pipe of the secondary pump 10. The annular space about the nozzle 11 in which the air pipe terminates, communicates beyond nozzle 11 through the openings 12 with the discharge pipe from the secondary pump 10. The secondary pump 10 has its suction connected with discharge pipe of the primary pump 7, there being a check valve 8 in the discharge pipe between this connection and the primary pump 7. The discharge pipe from the secondary pump 10 leads to the nozzle 11 from which a discharge pipe passes and terminates in the upper part of the reservoir 9. The discharge pipe from the primary pump 7 terminates in the lower part of reservoir 9. These discharge pipes are separated by a partition wall 6. The primary and secondary pumps are preferably of the centrifugal type.

Referring to Fig. 2, the condenser 1 is of the surface type having steam inlet 2 at the top. The discharge pipe 5 leads off from the bottom of condenser 1 and serves to carry off both air and water of condensation. A check valve 51 is located in this pipe 5. The water inlet pipe 3 leads into one end of the condenser and communicates with the chamber from which the tubes 13 lead. The discharge pipe 4 leads from the opposite end of the condenser and from the chamber to which the tubes lead. The discharge pipe 4 passes directly to the lower part of reservoir 9. The inlet pipe 3 is the discharge pipe of primary pump 7 whose suction leads from any convenient source. The discharge pipe 5 terminates annularly about a nozzle 11 in the discharge pipe of the secondary pump 10. The annular space about the nozzle in which the air and water discharge pipe 5 terminates, communicates beyond the nozzle 11 through openings 12 with the discharge pipe from the secondary pump 10. The secondary pump 10 has its suction connected with the discharge pipe 4 which in fact is the discharge from primary pump 7. Discharge pipe 4 has a check valve 80 below the connection to the suction of pump 10. The discharge pipe from the secondary pump 10 leads to the nozzle 11 from which a discharge pipe passes and terminates in the upper part of reservoir 9.

The pumps in both modifications may be on the same shaft and even in the same casing.

The operation of the barometric system is as follows: The steam entering the inlet pipe 2 is condensed by the water entering the inlet pipe 3, and the water of condensation and the condensing water are together discharged by the primary pump 7. All of this water passes the check valve 8 in the discharge pipe of the pump 7. The greater portion of the water discharged from the pump 7 passes directly to the reservoir 9. A small portion of the water discharged by pump 7 passes to the secondary pump 10 and is discharged thereby at a higher pres-

sure through the nozzle 11 to the reservoir 9. Air is removed from the condenser 1, through pipe 5 by being entrained through the opening 12 in nozzle 11, with the water flowing at a high velocity from this nozzle. In case pump 7 fails to operate, the water will accumulate in the condenser 1 until it is removed through pipe 5 by pump 10. To provide for this emergency the capacity of pipe 5 and pump 10 must be made sufficient to carry all the water. In this case check valve 8 prevents water from the reservoir 9 backing up into the condenser by atmospheric pressure. During this operation the air and water are removed in the same manner as air alone in the ordinary operation; but the pump 10 takes its supply directly from reservoir 9 instead of from the discharge of pump 7. The wall 6 in this case serves to prevent air from being drawn up through the discharge pipe from pump 7. In case both pumps fail to operate, the vacuum in the condenser 1 will immediately be broken by atmospheric air from reservoir 9 entering through the discharge pipe from the pump 10, through openings 12 in nozzle 11, annular space around nozzle 11 and pipe 5. This will prevent flooding of the engine with condensing water.

The operation of the surface condenser system of Fig. 2 is similar. The steam enters inlet 2 and condenses on the tubes 13. The water of condensation and the air pass out through pipe 5 and are entrained from the annular termination of pipe 5, around nozzle 11, through openings 12 and are discharged from the nozzle into reservoir 9. The condensing water is pumped by pump 7 through the inlet pipe 3, tubes 13, and the greater part is discharged through pipe 4 to the reservoir 9. Some of this water is taken from pipe 4 by the suction of pump 10 and discharged at a higher pressure through nozzle 11 in the discharge pipe of pump 10. It is at this point that the high velocity of the discharge through the nozzle 11 causes the air and water of condensation to be entrained from pipe 5 as above pointed out. In case pump 7 fails to operate, the pump 10 will take its supply from reservoir 9 through pipe 4 until check valve 80 is closed by such inlet flow. After this the supply for pump 10 will come through pump 7, inlet pipe 3, tubes 13 and outlet pipe 4, and the system will still be in working condition though less efficient. In case pump 10 fails to operate, the vacuum in the condenser will not be broken because of the check valve 51 in pipe 5.

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 desired to secure by Letters Patent,—

1. The combination in a condenser system, of a condenser, a pump for discharging water therefrom, and a pump and connections for discharging air therefrom, said latter pump having its suction directly connected to the discharge of said former pump.

2. The combination in a condenser system, of a condenser, a pump for discharging water therefrom, a pump for discharging air therefrom, an air pipe connecting from a water-free portion of said condenser to said air-discharging pump, and a connection from the discharge of said water-discharging pump to the suction of said air-discharging pump.

3. The combination in a condenser system, of a condenser, a pump for discharging water therefrom, a pump for discharging air therefrom, said latter pump having its suction directly connected to the discharge of said former pump, and an air pipe connecting from a water-free portion of said condenser to said air-discharging pump.

4. The combination in a condenser system, of a condenser, a pump for discharging water therefrom, a pump for discharging air therefrom, a lower connection between said condenser and said former pump, a separate upper connection between said condenser and said latter pump, and a connection from the discharge of said former pump to the suction of said latter pump.

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

R. D. TOMLINSON.

Witnesses:
G. F. De Wein,
Ella Brickell.