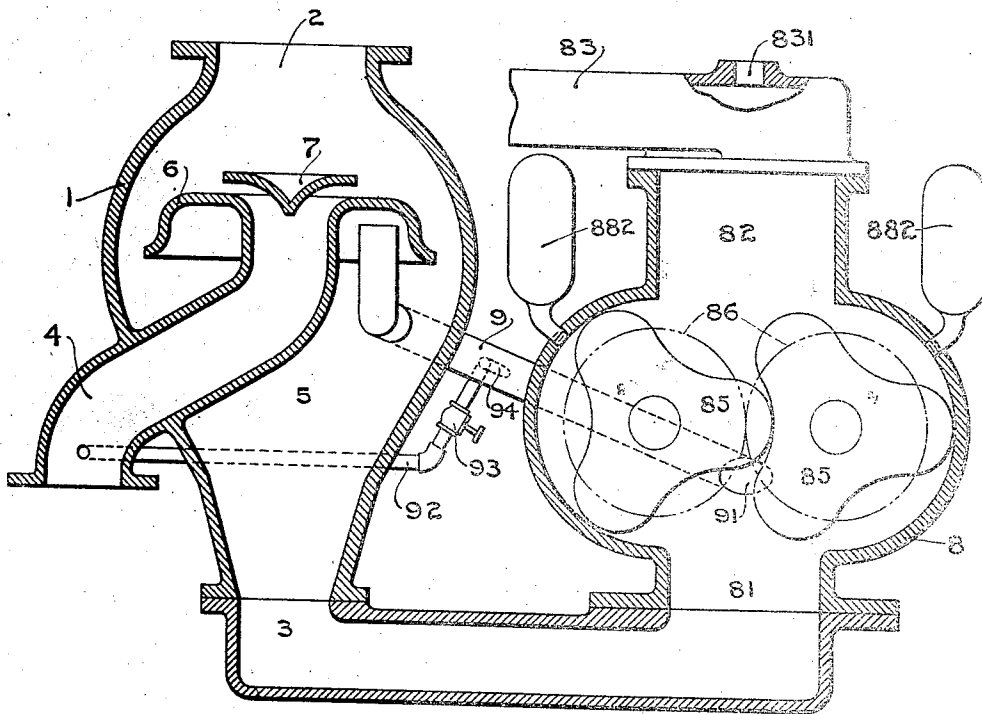


R. D. TOMLINSON.
CONDENSER AIR PUMP.
APPLICATION FILED JULY 11, 1910.

1,058,646.

Patented Apr. 8, 1913.



WITNESSES—

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CONDENSER AIR-PUMP.

1,058,646.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Original application filed January 12, 1907, Serial No. 351,973. Divided and this application filed July 11, 1910. Serial No. 571,265.

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 Condenser Air-Pumps, of which the following is a specification.

This invention relates to improvements in the construction of steam condensing apparatus and particularly to improvements in the construction of air pumps used in connection with condensers.

An object of the invention is to provide a condenser air pump which is simple in its construction and efficient in operation.

Another object is to provide a valveless pump in which the destructive effect of knocking due to the return of the discharging water into the vacuum spaces of the pump as these successively discharge their contents, is avoided.

This application is a division of an application for patent for steam condensing apparatus, Serial No. 351,973, filed January 12, 1907.

A clear conception of one embodiment of the invention can be obtained by referring to the accompanying drawing.

The figure shows a central vertical section through a condenser head and condenser air pump and the connections communicating between the two.

The condensing head 1 is provided with a steam inlet 2 at its top and a water discharge outlet at its lower end. A water inlet pipe 4 which spreads out within the condensing chamber 5 in the form of an umbrella or air trap 6, enters the condensing head 1 intermediate the inlet and outlet thereto. A deflector 7 is fixed to the water inlet pipe 4 at the end thereof which discharges into the condenser head 1. The pump 8 has its inlet 81 connected to the water outlet pipe 3 of the head 1. The discharge outlet 82 of the pump 8 is connected through the pipe 83 to any convenient discharge well, not shown. The pipe 83 is connected to the atmosphere by a port 831 which is located preferably near the discharge outlet 82. The pump 8 is of the rotary geared piston type and positively displaces the fluid pumped when in operation. The impellers 85 are geared together by gears 86, of which

gears the pitch lines alone are shown. The driving of the impeller shafts of the pump 8 is accomplished by means of a pulley or other similar means fixed to an overhanging end of one of the impeller shafts.

Air chambers 882 are placed in communication with the interior of the casing of the pump 8 at points slightly in advance of the tangent point on the impeller 85 at the time the following impeller lobe is working into coaction with the casing. This is to insure that the impeller lobes shall isolate a working space before opening up communication between the chamber 882 and the space above the inlet 81.

Equalizing or discharge pipes 9 lead from underneath the air trap 6 within the condenser head 1, through the head, and to the pump suction, discharging into the pump at inlets 91. These pipes 9 have no portion thereof dipping below and subsequently rising to a horizontal plane, or in other words, their structure is such as to avoid the formation of liquid traps, thus insuring that these pipes form a constantly open means for conducting gas from the condenser head 1. But one of these pipes 9 is shown in the figure, but in practice it is usual to apply two of them leading same to each side of the pump 8 and also from opposite points underneath the gas or air trap 6. Water conductor pipes 92 lead into the equalizing pipes 9 from any convenient source, as shown, for instance, from the condensing water inlet pipe 4. The conductor pipes 92 are controlled by valves 93, and terminate in nozzles or spray ends 94 within the pipes 9. The spray ends 94 are directed toward the pump 8.

The operation of the device is as follows: Steam is condensed in the condensing chamber 5 of the condenser head 1 as it enters the chamber at the steam inlet 2, by the inrush of condensing water through the pipe 4 at its discharge end just above the umbrella or gas trap 6. This water in rushing off from the umbrella is thrown against the inner walls of the condenser head 1, thus forming a seal which prevents the air from returning to the space above the umbrella. The condensed steam mingles with the condensing water and the mixture is discharged through the water outlet pipe 3 to the pump inlet 81. As the impellers 85 of the pump 8 rotate, they carry this mixture of con-

condensing water and condensed steam upwardly past the inner semicylindrical surfaces of the pump 8 and discharge same through the outlet 82. The water is then conducted through pipe 83 to the discharge well. Meanwhile, any air or gas which may have come into the condenser either with the steam or the condensing water, will gather underneath the umbrella or gas trap 6 and will from there be conducted through the equalizing pipes 9 and inlet 91 to the interior of the pump 8. The air or gas thus conducted through the pipe 9 will be cooled in its passage by the spray of water introduced into the pipe 9 from the condensing water inlet pipe 4 by means of the conductor pipe 92. It will be noted that the gases entering the pump 8 through the inlet 91 are admitted at the highest point possible above the normal water line in the pump inlet 81. The inlet 91 is located at the point at which the highest vacuum is maintained in any portion of the apparatus. The air or gas introduced at this point will be carried along by the impellers 85 together with any water entering through the inlet 81, and will be urged through the pump 8 with the water passing therethrough. When the impeller lobe passes the inlet to the air chamber 882, the water previously forced into the air chamber 882 will gradually pass out and break the vacuum in the pump space. As the impeller 85 proceeds and when the lobe leaves the inner semicylindrical surface of the pump casing and moves opposite the pump discharge 82, communication is established between the air chamber 882 and the pump discharge 82. The atmospheric pressure established in the discharge 82 will then cause water to rush back into the air chamber 882 until the next succeeding lobe of the impeller 85 passes the pipe connection between the air chamber and the interior of the pump.

It is obvious that the chambers 882 need not be closed at their tops as shown. It is also obvious that instead of having an air chamber communicating with the pump, merely a communication through the pump casing to the atmosphere would be sufficient. In the latter case the air would simply rush into the pump space to relieve the vacuum. There might be a slight discharge of water after the relieving of the vacuum, but this would not be much and could be easily drained away.

While the invention has been described as applied to a steam condenser system, it is obvious that it might be applied to any apparatus in which a gas or vapor is condensed to a liquid and also where during such condensation a high vacuum is to be maintained in the condensing chamber. Such conditions prevail in evaporators.

It should be understood that it is not de-

sired 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. The combination of a chamber, a gas trap in the chamber, a pump having a space therein for liquid, means for conducting liquid from the chamber to said liquid space of the pump, a separate constantly open means connecting the gas trap to said liquid space of the pump at a point intermediate the inlet and the discharge of the pump for conducting gas to the pump to commingle with the liquid in said liquid space, such gas conducting means being so located and extended that liquid therein will gravitate toward said liquid space of the pump.

2. The combination of a chamber, a pump having a space therein for liquid, a liquid passage between the chamber and said liquid space of the pump, and a constantly open gas passage connecting the chamber with said liquid space of the pump above the normal water level therein, said gas passage being so directed and extended as to gravitate liquid therein toward said liquid space of the pump.

3. The combination of a chamber, a pump having a space therein for liquid, means for conducting liquid from the chamber to said liquid space of the pump, and separate constantly open means of communication between the chamber and said liquid space of the pump, said means connecting with said liquid space of the pump from a level higher than that of the connection of the means with said liquid space of the pump.

4. The combination of a chamber, a mechanically operated pump, a constantly open means of communication for liquid between the chamber and the pump, and a means of communication constantly open for the free and unobstructed passage of gas between the chamber and the pump separate from the first mentioned means of communication and connecting to said pump at a higher level than the point of connection to said pump of the first mentioned means of communication.

5. The combination of a chamber, a pump, means for conducting liquid from the chamber to the pump, and separate means of communication constantly open for the free and unobstructed passage of gas leading from the chamber to the pump but both means connecting to the common pump chamber, said separate means being so located and extended that any liquid that might find its way therein will by gravity be carried into the pump and said separate means connecting to said pump at a higher level than the point of connection to said pump of the said liquid conducting means.

6. The combination of a chamber, a vacuum pump casing having a pair of coacting lobed impellers mounted therein and having a water passage leading from said chamber into said casing at the suction side thereof, and an air passage leading from said chamber into the suction side of said pump casing at a point within the portion of said casing traversed by the impeller lobes, said passage being so located and extended as to gravitate any water therein into said pump casing.

7. The combination, in a vacuum pump of the lobed impeller type, of an air inlet passage leading into the pump chamber at a point to communicate with the displacement spaces after they are cut off from the suction side of the pump and before they are delivered to the discharge side of the pump.

8. The combination, in a vacuum pump having a pair of coacting rotary lobed impellers and its discharge outlet uppermost, of an air inlet passage leading into each side of the impeller chamber in position to communicate with the displacement spaces after they are separated from the suction side of the pump and before they are delivered to the discharge side of the pump.

9. A vacuum pump having a pair of coacting rotary lobed impellers mounted therein and having a water passage leading

into the bottom of the impeller chamber and an air passage leading into the suction side of the impeller chamber at a point above the lowermost position of the impeller lobes.

10. The combination of a chamber, a pump having a pair of coacting rotary lobed impellers, means for conducting a liquid from the chamber to the pump, and separate means for conducting gas from said chamber to said pump at a point within the travel of the impeller lobes.

11. The combination of a chamber, a pump having a space therein for liquid, a liquid passage between the chamber and said liquid space of the pump, and a constantly open gas passage connecting the chamber with said liquid space of the pump.

12. In combination, a chamber, means for conducting liquid from said chamber, a constantly open means for conducting gas from said chamber said conducting means having structural features by means of which liquid traps are avoided, and a single pump for urging liquid and gas respectively through their said conducting means.

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

ROYAL D. TOMLINSON.

Witnesses:

G. F. DE WEIN,
W. H. LIEBER.