

1,058,392.

Patented Apr. 8, 1913.

Fig. 2.

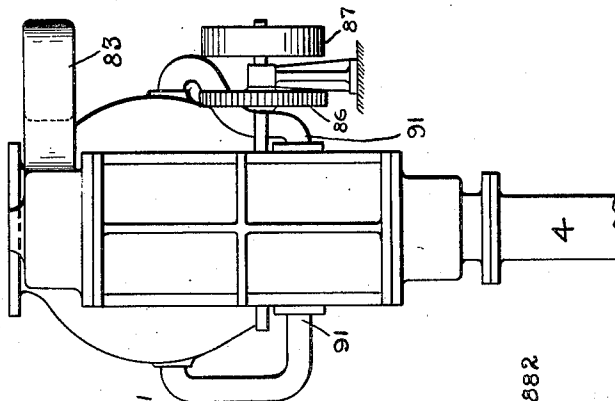


Fig. 1

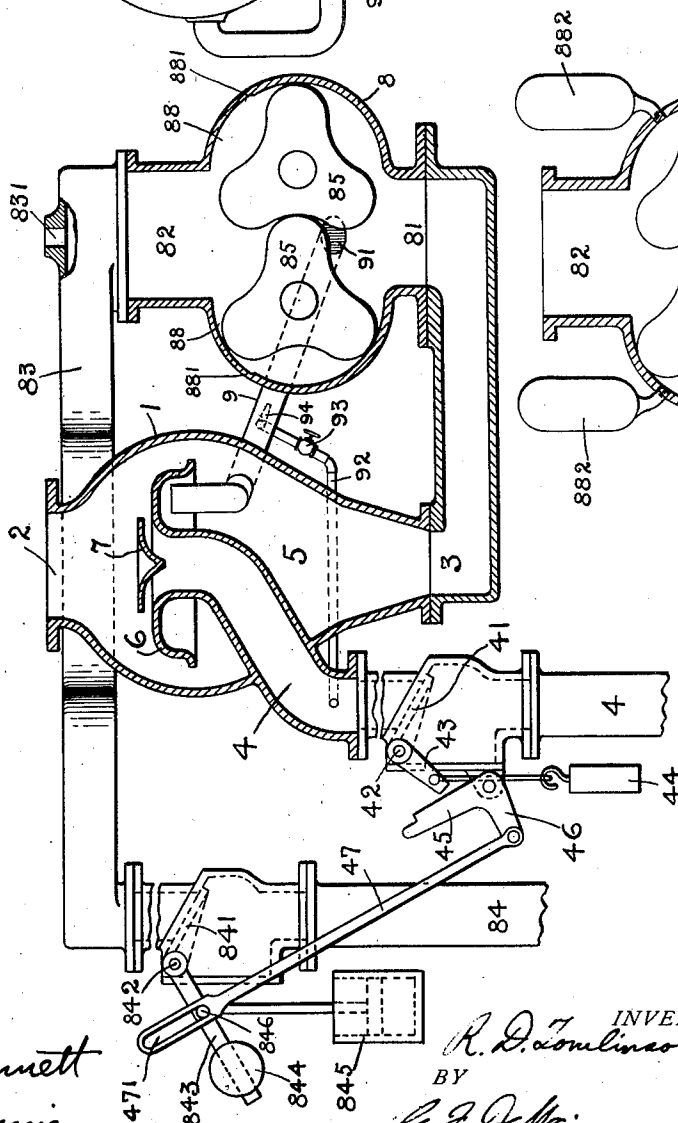


Fig. 3.

WITNESSES:
Frank E. Dennett
John C. Rennie

INVENTOR
R. D. Tomlinson
BY
C. J. DeWitt ATTORNEY.

UNITED STATES PATENT OFFICE.

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

STEAM-CONDENSING APPARATUS.

1,058,392.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Application filed January 12, 1907. Serial No. 351,973.

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 Steam-Condensing Apparatus, of which the following is a specification.

This invention relates to steam condensing apparatus and has for its object: first, the provision of air communication between the condensing chamber and the suction of the pump. Second, providing a condenser with a pump which serves to effectively remove both the water and the air or gas from the condensing chamber without separate means for withdrawing the air. Third, the provision of a valveless pump in which is eliminated the destructive effect of knocking caused by the return of the discharged water to the vacuum spaces of the pump after successive discharges of the contents of these chambers. Fourth, providing a means for automatically cutting off the flow of condensing water into the condensing chamber when the flow from the pump or from the condensing chamber ceases for any reason whatever.

That portion of the invention relating to the pump itself is the subject of an application Serial No. 571,265, filed July 11, 1910, as a division of the present case by requirement of the Commissioner of Patents.

The invention is described in reference to the accompanying drawing in which,—

Figure 1 is an elevation partly in section; Fig. 2 is an end elevation; and Fig. 3 is a vertical section of a modified form of pump, parts being broken away.

The condensing head 1 has a steam inlet 2 at the top; a water discharge outlet at the bottom and intermediate the inlet 2 and the outlet pipe 3; a water inlet pipe 4 which spreads out within the condensing chamber 5 in the form of an umbrella or air trap 6. A deflector 7 is fixed at the discharge end of the water inlet pipe 4. A pump 8 has its inlet 81 connected to the water outlet pipe 3. Its discharge outlet 82 is connected through the pipe 83 to any convenient discharge by means of the pipe 84. The pipe 83 is connected to the atmosphere by a port 831 preferably near the discharge outlet 82. The pump is of the rotary geared piston type and positively displaces the fluid pumped when

in operation. The impellers 85, 85, are geared together by gears 86, shown in Fig. 2. One of the impeller shafts is extended and has fixed thereon a driving wheel 87.

The pump 8, as shown in Fig. 1, has portions 88, 88, of its interior curved surface cut away so as to allow the fluid which is being pumped to pass between the casing and the impellers while the impellers are passing the portions 88. These cut-away portions 88, commence at points 881, 881, which are slightly in advance of the tangent point on the impeller at the time the following impeller lobe is entering into working coaction with the casing. This is to insure that the impeller lobes shall isolate a working space before opening up communication through the cut-away portions 88 to the discharge. For these same considerations the pump casing on each side is formed to complete a semi-cylindrical working surface including the cut-away portion 88.

In the modification shown in Fig. 3, instead of using the cut-away portions 88 of Fig. 1, air chambers 882, 882, are placed in communication with the casing of the pump 8 at points again slightly in advance of the working pump space immediately after its completion.

Equalizing pipes or air 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. But one of these pipes is shown in Fig. 1, but in practice it is usual to apply two of these leading them to each side of the pump 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, for instance, as shown, from the condensing water inlet pipe 4. These conductor pipes 92 are controlled by valves 93. The conductor pipes 92 terminate in nozzles or spray ends 94 within the pipes 9 and directed toward the pump.

The condensing water inlet pipe 4 is controlled by a flap valve 41 which swings on pivot 42 to which is attached an arm 43. The arm 43 is weighted by attaching thereto by any convenient linkage the weight 44, so as to close the valve 41 when not otherwise opposed. On the pipe 4 is pivotally mounted a bell crank lever, one arm 45 of which is notched so as to receive the end of arm

43 to set the valve 41 in an open position. The other arm 46 of the bell crank lever is connected by rod 47 to controlling means about to be described.

5 The controlling means for valve 41 in the water inlet pipe 4 consists of the following: In the discharge pipe 84 is pivotally mounted a flap valve 841. On the pivot 842 of this valve is mounted an arm 843 carrying a
10 weight 844. The arm 843 is connected by any convenient linkage to the piston of a dash pot 845. The arm 843 is also connected to the rod 47 by means of a pin 846 on the arm 843 sliding in a slot 471 in the rod 47.
15 These parts are so designed that when the arm 43 is latched upon the arm 45 of the bell crank, the valve 841 will be partly open and be capable of opening still wider without affecting the set position of arm 43.
20 The valve 841, however, cannot be closed without having rod 47 shoved downwardly by the pin 846, thus disengaging the arm 43 from the arm 45 of the bell crank and allowing weight 44 to close valve 41.

25 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 previous inrush of condensing water
30 through the pipe 4 at its discharge end just above the umbrella or gas trap 6. This water in running off from the umbrella is thrown against the inner walls of the condenser head thus forming a seal which pre-
35 vents the air from returning above the umbrella. The condensed steam mingles with the condensing water and the whole is discharged through the water outlet 3 to the pump inlet 81. The impellers 85 of the
40 pump as they rotate carry this water upwardly past the inner semi-cylindrical surfaces of the pump and discharge the same at the outlet 82. The water is then conducted along the pipes 83 and 84 to the final
45 discharge. Meanwhile any air or gas which may have come into the condenser either with the steam or with the condensing water will gather underneath the gas trap 6 and be conducted from thence through the
50 equalizing pipes 9, and 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 conductor pipe 92. These gases enter the pump through the
55 inlet 91, which is located at the highest point possible above the normal water line in the pump inlet 81. The inlet 91 is the point at which the highest vacuum is maintained throughout the entire apparatus.
60 The air or gas is introduced at this point, will be carried along by the impellers together with any water entering at the inlet 81, and will be urged through the pump in the same way as the water. When
65 the forward lobe of the impeller reaches

the point 881, the vacuum in the pump space between the impeller and the pump casing will be slowly broken by water returning from the pump discharge 82 and rushing into the pump space through the
70 passage formed between the impeller lobe and the pump casing by reason of the cut-away portions 88. If there is considerable air carried through the pump, the vacuum will be partial only in the pump spaces.
75 Under normal conditions the vacuum will be high. The discharge of water and air through the pump outlet 82 will be carried up into pipe 83, the air will be discharged through port 831 to the atmosphere.
80

An alternative construction for relieving vacuum in the pump spaces is shown in Fig. 3. This operates in much the same way as that shown in Fig. 1. When the impeller lobe passes the inlet to the air chamber, the
85 water previously forced into the air chamber 882 will gradually rush out and break the vacuum in the pump space. As the impeller proceeds and when the lobe leaves the inner semi-cylindrical surface of the pump
90 and moves opposite the pump discharge 82, communication is established between the air chamber 882 and the pump discharge 82. Atmospheric pressure will then cause water to rush back into air chamber 882 until the
95 succeeding lobe of the impeller passes the pipe connections between the air chamber and the pump.

It is obvious that the air chamber 882 need not be closed at the top. It is also
100 obvious that instead of having an air chamber communicate with the pump, merely a communication through the pump casing to the atmosphere would be sufficient. In the latter case the atmospheric air would
105 simply rush into the pump space to relieve the vacuum. There might be slight discharge of water after the vacuum was relieved, but this would not be much and could be easily drained away.
110

The water discharged from the pump 8 in passing through the pipes 83 and 84, pushes back the valve 841, keeping the
115 same open and the arm 43 latched upon the bell crank. As soon, however, as the means for operating pump fail, or as soon as some other condition prevails which prevents removal of water from the condenser, the valve 841 will close because of lack of
120 flow of water past it, the weight 844 then operating to close the same. During the closing, the pin 846 will shove the rod 47 downwardly thus disengaging the bell crank from the arm 43 and allowing the weight
125 44 to close valve 41, thereby effectively shutting off flow of water to the condenser. This will prevent the disastrous results ensuing from a backing up of the water into the engine.

While the invention has been described in 130

reference to a steam condenser, it is obvious that it might be applied to any apparatus where it is desired to condense a gas or vapor to a liquid and also where during such operation a high vacuum is to be maintained in the condensing chamber. This is the case, for instance, in evaporators.

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 condensing apparatus, the combination of a chamber, a pump, a conduit between the chamber and the pump, a liquid inlet means to the chamber, cut-off means for the inlet means, and automatic means controlled by the pump discharge flow for actuating the cut-off means.

2. The combination in a condenser, of a fluid inlet means, a fluid discharge means

including a pump, and means actuated by the flow of the discharge from said pump for stopping the fluid inlet flow.

3. The combination in a condenser, of a fluid inlet means, a fluid discharge means, and means actuated directly by the discharge flow for stopping the inlet flow.

4. In a condensing apparatus, a condensing chamber, a pump having a discharge conduit, a conduit connecting said chamber with said pump, means for admitting liquid to said chamber, valve means for controlling said fluid admission means, and means controlled directly by the discharge flow from said pump for actuating said valve means.

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

ROYAL D. TOMLINSON.

Witnesses:

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