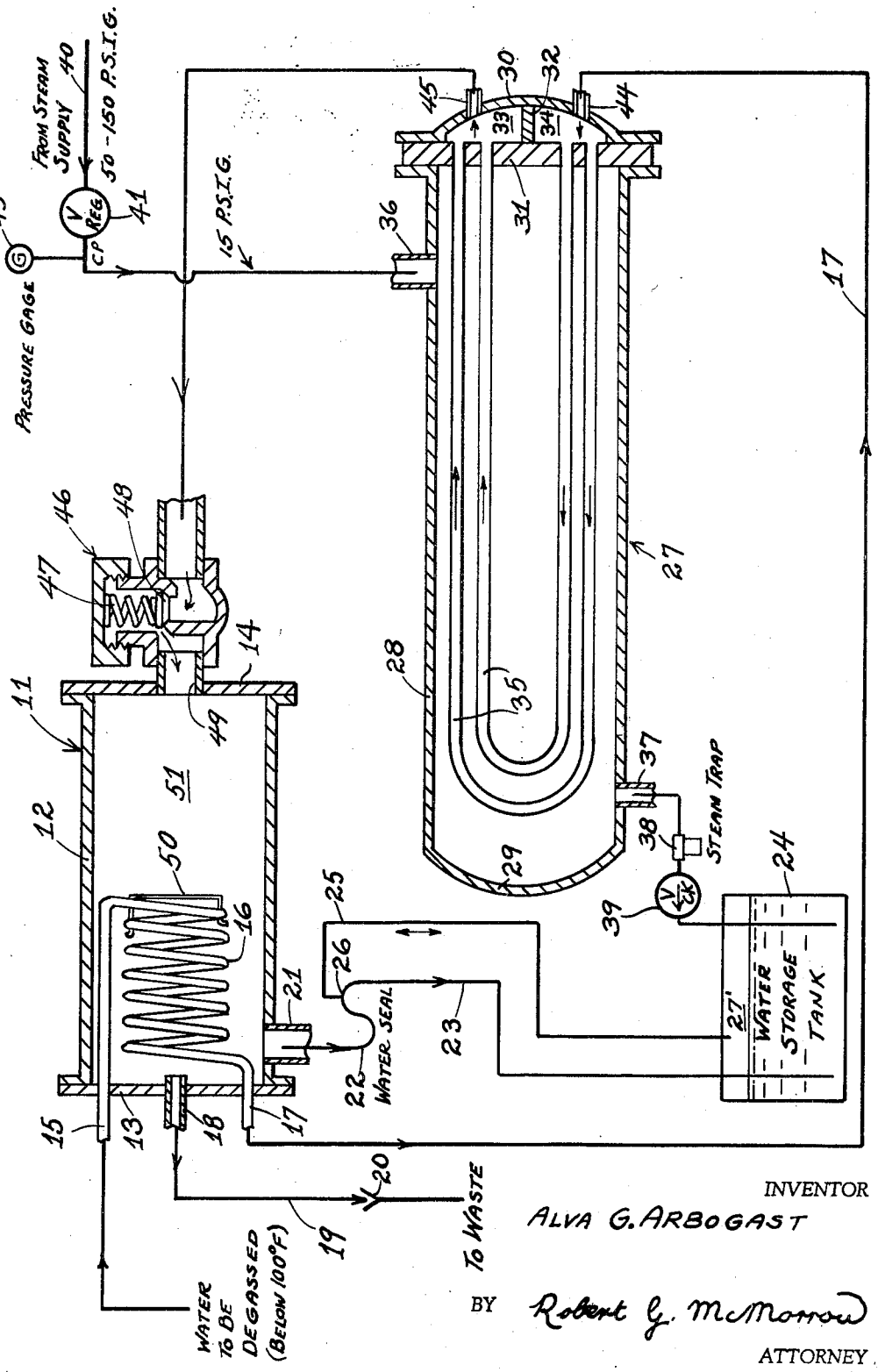
Jan. 13, 1970 A. G. ARBOGAST 3,488,925

LIQUID DEGASIFYING SYSTEM

Filed Dec. 11, 1967



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United States Patent Office 3,488,925
Patented Jan. 13, 1970

3,488,925

LIQUID DEGASIFYING SYSTEM

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Filed Dec. 11, 1967, Ser. No. 689,431
Int. Cl. B01d *19/00*
U.S. Cl. 55—192 1 Claim

ABSTRACT OF THE DISCLOSURE

A degasifying system for use in the treatment of liquid to be used in industrial process work. The system includes a flash chamber at atmospheric pressure containing condenser coils. The liquid is initially fed through these condenser coils, which are maintained at a relatively low temperature by the incoming liquid. From the condenser coils the liquid goes through a heat exchanger, heated by steam at about 250° F. The hot liquid is released into the flash chamber through a back pressure relief valve. The flashing hot liquid vaporizes and contacts the condenser coils, recondensing and flowing to a storage receptacle. In flashing, the the liquid gives up oxygen, air, or other gases previously contained therein.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to systems for degasifying liquids, and more particularly to a system for the degassing treatment of water to be subsequently employed in industrial processes.

Description of the prior art

Fluid handling systems have heretofore proposed the expulsion of super-heated fluids into expansion chambers for various purposes.

SUMMARY OF THE INVENTION

A main object of the invention is to provide a novel and improved liquid degasifying system which involves relatively simple apparatus, which is reliable in operation, and which efficiently removes air, dissolved oxygen, aromatic gases, or other foreign materials from liquid intended to be subsequently employed in industrial processes.

A further object of the invention is to provide an improved water-degasifying system which can be installed in a relatively small space, which is economical to operate, and which employs relatively inexpensive components.

A still further object of the invention is to provide an improved water-degasifying system for use in treating water from boilers, or from any other source, to remove undesired gases or other foreign substances therefrom, the system employing a liquid flashing technique which is highly effective in separating the undesired gases or other materials from the water, the system employing components which are easy to operate and to maintain in proper working order, the system having a relatively high flow capacity, and the system being particularly suitable for continuous or long-term uninterrupted operation without requiring any substantial amount of human supervision.

A still further object of the invention is to provide an improved water degasification system which is easy to install, which is safe to operate, and which provides a dependable continuous supply of purified degassed water for use in industrial processes requiring same.

Further objects and advantages of the invention will

become apparent from the following description and claims, and from the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The single figure of the drawing diagrammatically and schematically illustrates a typical water degasifying system constructed in accordance with the present invention, with certain parts thereof being shown in longitudinal and vertical cross-section.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, **11** designates a flash chamber having the generally cylindrical longitudinal wall **12** and the respective front and rear end walls **13** and **14**. An inlet conduit **15**, for water to be degassed, extends sealingly through front end wall **13** to the rear end of a longitudinally extending condenser coil **16** mounted substantially axially in the forward end portion of chamber **11**. The condenser coil has the outlet conduit **17** extending sealingly through the lower portion of wall **13**, as shown.

Substantially centrally mounted in front end wall **13** is a relatively small-diameter gas release conduit fitting **18** connected to a downwardy pitched conduit **19** leading to a waste conduit **20** under atmospheric pressure. Conduit **19** is downwardly pitched from gas release fitting **18** to minimize the return of "sour gas" back into the flash chamber **12** and to thereby minimize recontamination of the degassed liquid obtained by the system.

Chamber **11** is provided with a bottom discharge conduit **21** in wall **12** adjacent end wall **13**. Conduit **21** is connected through a water seal unit **22** and a conduit **23** to a storage tank **24** for degassed water to be eventually used in an industrial process.

Water seal unit **22** is protected against siphoning by the provision of an anti-siphon vent conduit **25** connecting the top of the inverted water seal U-bend **26** to the vapor space **27'** in the upper portion of tank **24**.

Designated at **27** is a conventional heat exchanger comprising an elongated chamber **28** having the opposite outwardly convex end walls **29** and **30**, with a vertical partition plate **31** mounted therein adjacent end wall **30**. A transverse horizontal partition plate **32** is centrally secured between plate **31** and end wall **30**, defining upper and lower compartments **33** and **34**. A plurality of U-shaped horizontally extending heat exchanger tubes **35** are provided in chamber **28**, with their inlet ends secured in the lower portion of plate **31**, in communication with compartment **34**, and their outlet ends secured in the upper portion of plate **31**, in communication with compartment **33**. Chamber **28** is provided in its top wall adjacent plate **31** with a steam inlet conduit **36** and in its bottom wall adjacent end wall **29** with an outlet conduit **37**.

Conduit **37** is connected through a conventional steam trap **38** and a check valve **39** to the lower region of storage tank **24**.

A source of steam is connected by a conduit **40** through a conventional pressure-regulating valve **41** to inlet conduit **36**. The steam supplied through conduit **40** may be under any pressure sufficient to provide steam at the required pressure to line **36**. The pressure-regulating valve **41** is set to provide an outlet pressure of 15 pounds per square inch gauge, which is therefore at a temperature of about 250° F. The input steam pressure in supply line **40** may be, for example, between 50 and 150 pounds per square inch gauge.

A conventional pressure gauge **43** may be provided, connected to line **36**.

The outlet conduit **17** of condensing coil **16** is con-

nected to an inlet conduit **44** in the lower portion of end wall **30** communicating with compartment **34**, and thus with the inlet ends of tubes **35**. An outlet conduit **45** is provided in the upper portion of wall **30**, communicating with compartment **33**, and thus with the outlet ends of tubes **35**. Conduit **45** is connected to the rear end of flash chamber **11** through a spring-loaded back pressure relief valve **46**. The spring **47** of relief valve **46** is designed to maintain a back pressure in conduit **45** of approximately 15 pounds per square inch gauge and to allow the valve disc element **48** thereof to unseat when this designated pressure is reached or exceeded. This valve action permits the water in tubes **35** to be heated to a temperature much higher than 212° F., thus providing the heat necessary to cause flashing of the gas-bearing water as it enters flash chamber **11**, as will be presently described.

Valve **46** is connected to the flash chamber **11** through a relatively short inlet conduit **49** centrally mounted in rear wall **14**. A baffle plate **50** is mounted on the rear end of condensing coil **16**, facing inlet conduit **49**, but spaced therefrom by the flash space **51**.

In operation, water containing dissolved oxygen and/or other non-condensable gases enters the degasifying system through conduit **15** and passes through the condensing coil **16**. The temperature of the incoming water is below 100° F. This relatively low temperature keeps the surface temperature of the coil **16** cool enough to condense any steam coming into contact with its surface.

The non-condensable gas released within the flash chamber **11** is vented out of the system through the gas release fitting **18** and conduit **19** to the waste conduit **20** under atmospheric pressure. As above mentioned, conduit **19** is pitched downwardly from gas release fitting **18** to minimize the possibility of "sour gas" flowing back into chamber **11**. This avoids recontamination of the degassed liquid in the system.

Gas-bearing water flows from coil **16** through conduit **17** into compartment **34** and thence through the steam-heated tubes **35** of heat exchanger **27**. The steam inside the chamber **28** surrounding the tubes **35** is maintained at 15 pounds per square inch gauge, with a corresponding saturated temperature of 250° F.

The condensate in the heat exchanger chamber **28**, resulting from contact of the steam with the tubes **35**, drains off through conduit **37**, stem trap **38** and check valve **39** into the storage tank **24**.

Gas-bearing water at 250° F. leaves tubes **35** through compartment **33** and conduit **45** and enters the back pressure relief valve **46** at 250° F.

The pressure of the gas-bearing water flowing into the valve **46** is maintained close to 15 pounds per square inch gauge by the biasing action of the spring **47** on the valve disc element **48**. This valve action permits heating the water to a temperature much higher than 212° F., thus providing the heat necessary to cause flashing of the gas-bearing water responsive to the unseating of valve disc element **48**, which occurs as a result of the pressure build-up beneath the disc element. The water flashes into steam as it enters the flash chamber **11** through the short conduit **49**, the chamber **11** being at a pressure only slightly more than atmospheric, wherein the corresponding water boiling point is only slightly higher than 212° F.

Chamber **11** operates at a pressure slightly higher than atmospheric because of the water seal **22** and the restriction caused by the relatively small-diameter outlet conduit **18**. This pressure is of the order of 2 to 3 inches of water above atmospheric pressure. As above mentioned, the water seal **22** cannot siphon because it is protected from siphoning by conduit **25** which is connected to the vapor space of the storage tank **24**.

When flashing occurs in space **51**, the undesired oxygen molecules, or molecules of other undesired gas in the water, separate out, the separation action being aided by the impact of the flashed liquid against the baffle plate **50**, although it is mainly caused by the sudden expansion which occurs when the superheated liquid flashes into steam.

As the flashing water enters the chamber **11**, heavy liquid particles fall to the bottom of the chamber and the flash steam and liberated gases break free in the space **51** inside the chamber. This steam and gas mixture strikes the baffle plate **50**, which forces it to flow into the space surrounding coil **16**.

The degasified water vapor condenses as a result of contact with the condensing coil **16**, and all the resultant degasified water discharges through conduit **21** and water seal **22** to the conduit **23** and thence to the storage tank **24**, completing the cycle.

While a specific embodiment of an improved water degasifying system has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

I claim:

1. In a liquid degassing system: a flash chamber having a forward end wall and a rear end wall and a horizontal axis; means substantially venting said flash chamber to atmosphere comprising a relatively small diameter gas vent conduit mounted in the forward end wall of the flash chamber, said gas vent conduit being downwardly pitched from its connection with said forward end wall to minimize the return of gas back into the flash chamber; a longitudinally extending condenser coil mounted substantially axially in the forward end portion of the chamber; a baffle plate transversely mounted on the rear end of said condenser coil; a source of water to be degassed; conduit means connecting said source to one end of the condenser coil; a heat exchanger having heat exchanger tubes, a heating space surrounding said tubes, and respective inlet and outlet spaces in communication with the ends of the tubes; conduit means connecting the outer end of the condenser coil to said inlet space; a source of superheated steam at a temperature of the order of 250° F.; conduit means connecting said last-named source to said heating space; said flash chamber rear wall being provided with a substantially centrally-located, relatively short inlet conduit; conduit means connecting the outlet space of the heat exchanger to said short inlet conduit; a spring-loaded back pressure relief valve in said last-named conduit means located adjacent said inlet conduit and having a loading spring designed to maintain a back pressure in said last-named conduit means corresponding to a water temperature substantially higher than 212° F., whereby to provide the heat necessary to cause flashing of gas-bearing water as it enters the flash chamber, storage means for degassed water; and conduit means located to the forward wall connecting the bottom of the flash chamber to said storage means.

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