

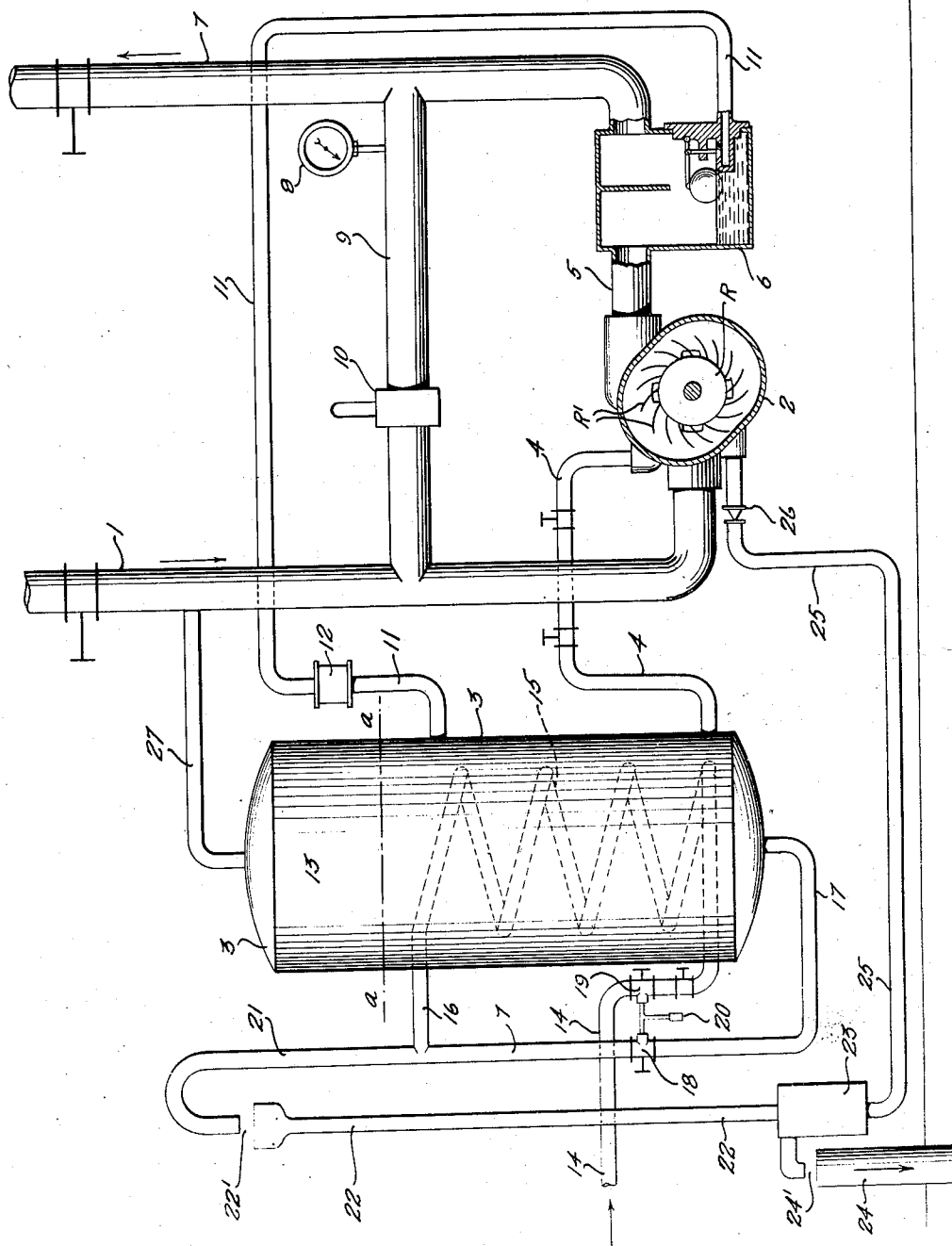
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GAS PUMPING SYSTEM

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GAS PUMPING SYSTEM

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27 Claims. (Cl. 230—79)

This invention relates to gas pumping systems, or systems in which a gas is given an augmented pressure. It has particular reference to those pumping or pressure booster systems in which a liquid seal is employed, or wherein a liquid cooling medium is used, and in which the gas is hazardous or valuable.

5 An object of my invention is to establish means for safely imparting an increased pressure to a body of gas.

10 Another object of my invention is to provide liquid means for sealing such a system as described above, and means for absorbing and dissipating the heat of compression and frictional heat evolved in said system.

15 A further object of my invention is to provide means for returning to such a system any gas which may be dissolved in the heat absorbing medium, thus preventing the escape of hazardous or valuable gases.

20 A still further object is to provide means for the recirculating, storage, and cooling of the heat absorbing medium, and means for automatically maintaining constant its volume within the system.

25 These and other objects will be evident from the following description and the accompanying drawing, the latter being an elevation of a gas pumping system embodying my invention. Portions of the system are shown in section to better illustrate their detail.

30 Referring to the drawing, the invention is shown embodied in a system used to boost the pressure of a gas, such as acetylene, delivered to it at low pressure from a holder, generator or similar device, by means of a liquid-cooled, liquid-sealed rotary gas pump.

35 The gas, at a low pressure, enters the system through the pipe 1 and is delivered to the rotary gas pump 2. The heat absorbing medium, such as water, is fed by gravity from the storage tank or reservoir 3, to the gas inlet of the pump by means of the pipe 4. As shown, a rotor R having vanes R' of equal length rotates freely in the elliptical pump casing that is partially filled with water. As the rotor turns, the elliptical shape of the chamber permits centrifugal force to throw water out of the spaces between the vanes, where-
40 by gas will be drawn into such spaces through the inlet ports. Water is forced back into these spaces as the rotor turns, compressing the gas, which is discharged by the re-entering water when the outlet ports are reached. The mixture of gas and gas-saturated water is discharged, at
45 an increased pressure from the pump 2, through

the pipe 5. Within the pump the water serves both as a liquid seal, and as a heat absorbent, thus precluding the possibility of fire or explosion due to the heat of compression and friction.

5 The discharged mixture passes from the pipe 5 to a commercial form of water separator 6, wherein the gas is substantially separated from the water. The pipe 7 serves to convey the gas, now cooled to normal and at the proper pressure, to the point of consumption. The pressure gauge 8, the by-pass line 9, and the pressure regulator 10 are precautionary measures to prevent the booster pump 2 from building up pressures in the system in excess of the limits of safety.

15 From the water separator 6, the water, now saturated with the gas and with its temperature raised above normal, is conducted back to the reservoir 3 by the pipe 11. A sight gauge 12 affords visual assurance of operation.

20 The water within the reservoir is cooled by means of a continuous flow of additional cooling water entering by means of the pipe 14, and flowing through the closed coil 15. The gas which is evolved by the water from the pump, upon cooling, is collected in the chamber 13 above the
25 water level *a-a* in the reservoir.

The pipe 16, through which the cooling water in the coil 15 leaves the reservoir 3, is connected to an overflow pipe 17 which communicates with the interior of the reservoir. The pipe 16 also connects with a waste drain 22 by means of pipe 21, and an open connection 22'. The pipe 21 extends to such a height above the desired level of recirculating heat-absorbing water in the reservoir, as is necessary to maintain this desired level (*a-a*) against the entering gas pressure in the pipe 1, which communicates by pipe 27 with the gas chamber 13 in the top of the reservoir.

35 The waste drain 22 enters a drain trap 23, and by a second open connection 24' is connected to a final drain 24. The open connections 22' and 24', in the drain line, are protections against siphonic action which might otherwise completely drain the system.

40 A pipe 25 also connects the drain trap 23 and the pump 2, by means of a check valve 26, to prevent flooding of the system when the pump is not operating.

45 Valves 18 and 19 in the overflow line 17 and the cooling water supply line 14 are so placed as to be actuated by a common handle 20. This insures open connection from the entering cooling water in the coil 15 to the interior of the reservoir 3, during operation, and thereby automatically maintains a constant supply of water to be
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recirculated through the pumping system. This provision constantly secures replacement of any water carried by the gas past the separator 6 and out of the system. This also automatically counter-balances evaporation and other such losses within the system.

From the foregoing, it will be apparent that my improved gas pumping system embodies means for recirculating a liquid cooling medium, the supply of which is automatically maintained substantially constant, and the absorbed gas of which is recovered during the operation of the system. While a preferred embodiment of the invention is shown and described in detail, it will be understood that various changes may be made in the disclosed arrangement without departing from its novel principles, and that certain features thereof may be utilized independently of others.

I claim:

1. A gas pumping system comprising the combination of a pump; means for delivering gas to the inlet of said pump; means separate from the gas delivering means and including a reservoir and a conduit connecting the reservoir with a source of liquid supply for supplying liquid to the inlet of said pump and a part of said conduit being in heat exchange relation with the contents of the reservoir; means for separating liquid from the mixture of gas and liquid discharged by said pump; and means for returning such separated liquid to the inlet of said pump.
2. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet of said pump; means for supplying liquid to the inlet of said pump; means for separating liquid from the mixture of gas and liquid discharged by said pump; means whereby said separated liquid is recirculated through said system; means for recovering gas remaining in the liquid so recirculated; and means for conducting additional liquid to the system so constructed and arranged as to both maintain the supply of liquid in the system substantially constant and cool the liquid in the system.
3. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet of said pump; means distinct from the gas delivering means for supplying liquid to the inlet of said pump; means for separating liquid from the mixture discharged by said pump; means for cooling the liquid supplied to said pump; means for returning such separated liquid to the liquid circulating system and to the inlet of said pump; means for recovering residual gas remaining in the liquid after being returned to the liquid system and prior to being returned to the pump.
4. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet of said pump; means for supplying liquid to the inlet of said pump; means for separating liquid from the mixture discharged from said pump; means whereby said liquid is recirculated through said system and cooled prior to its admission to said pump; means for recovering residual gas from the recirculated liquid; and means for returning the recovered gas to the pump.
5. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet of said pump; means for supplying liquid to the inlet of the pump; means for separating liquid from the mixture discharged by said pump; and means whereby the gas dissolved by said liquid, during contact with said gas, is recovered and returned to the pumping system.

6. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet of said pump; means for supplying liquid to the inlet of said pump; means for separating liquid from the mixture of liquid and gas discharged from said pump; and means whereby such separated liquid and the gas carried thereby are returned and separately delivered to the inlet side of the pump.

7. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet of said pump; means for supplying liquid to the inlet of said pump; means for separating liquid from the mixture discharged by said pump; means whereby said liquid is recirculated in said system; means for cooling the liquid prior to its admission to said pump, and means whereby gas evolved from said liquid, during cooling, is recovered to the system.

8. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet side of said pump; means for supplying liquid to the inlet of said pump; means for separating liquid from the mixture discharged by said pump; means whereby said liquid is recirculated in said system; means for cooling the liquid prior to its admission to said pump, and conduit means connecting the system with a source of liquid supply and so constructed and arranged that the supply of circulating liquid in said system is maintained substantially constant and cooled by liquid from a single source.

9. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet of said pump; means for supplying liquid to the inlet of said pump; means for separating liquid from the mixture discharged by said pump; means for recirculating said liquid in said system; means for cooling the liquid prior to its admission to said pump; means for recovering dissolved gas evolved from said liquid during cooling; and automatic means whereby a substantially constant supply of said circulating liquid is maintained.

10. A gas pumping system comprising the combination of a gas pump; means for delivering gas to the inlet of said pump; means, including a liquid reservoir, for supplying liquid to the inlet of said pump; means for separating liquid from the mixture of gas and liquid discharged from said pump; means whereby the separated liquid is returned to said reservoir; means for cooling the liquid in said reservoir; and means whereby gas returned to said reservoir is delivered to the inlet side of said pump.

11. In a gas pumping system comprising a gas pump; means for delivering gas to the inlet of said pump; means for supplying liquid to the inlet of said pump; and means for separating liquid from the mixture discharged from said pump; the combination of a liquid reservoir; means for supplying liquid for cooling the contents of said reservoir; means for circulating liquid through said reservoir and said pump; means for recovering gas evolved from the liquid contents of said reservoir; and means whereby the waste overflow from said cooling means automatically maintains a substantially constant supply of liquid within said reservoir.

12. The combination of a liquid reservoir; means for supplying liquid for cooling the contents of said reservoir having a waste overflow; means for circulating liquid out of and back into said reservoir, and means whereby the waste overflow of said cooling means maintains a sub-

stantially constant supply of liquid within said reservoir.

source of liquid supply constructed and arranged for cooling the liquid in said reservoir and for at the same time maintaining substantially constant the supply of liquid in the system.

13. The combination of a liquid reservoir; means for supplying liquid for cooling the contents of said reservoir; means for circulating liquid out of and back into said reservoir; means whereby the waste overflow of said cooling means maintains a substantially constant supply of liquid within said reservoir; and means for recovering gas evolved from said liquid contents of said reservoir during cooling.

20. The combination of a liquid container; a liquid conduit in heat exchange relation with the liquid content of said container; means for supplying liquid to said conduit; means for circulating said liquid content out of and back into said container; and means whereby liquid from said conduit maintains substantially constant the liquid content of said container.

14. A system for boosting the pressure of acetylene comprising a gas pump; means for delivering acetylene to the inlet of said pump; a water reservoir; means for conducting water from said reservoir to the inlet of said pump; means for separating water from the mixture of acetylene and water discharged from said pump; means whereby the water so separated is returned to said reservoir; means whereby acetylene, carried back to said reservoir with such separated water, is returned to the inlet side of said pump; a conduit whereby cooling water may be circulated through the body of water in said reservoir; and a pipe connecting the discharge of said conduit to the interior of said reservoir and arranged so that the waste overflow from said conduit automatically maintains a substantially constant supply of water in said reservoir.

21. In a system for circulating fluid, means for causing circulation of fluid in the system; and a single means comprising a continuous conduit leading from a source of liquid supply and connected with said system so as to be in heat exchange relation to a part of said system for cooling the fluid therein and at the same time for constantly maintaining a supply thereof in the system.

15. A system according to claim 14, in combination with valve means for simultaneously controlling the admission of water to said conduit and to said reservoir.

22. In combination, a system having means for directing a fluid along a course; means for cooling the fluid in said system comprising a conduit for supplying cooling fluid to said system, said conduit including portions arranged in heat exchange relation with each other.

16. A gas pumping system comprising the combination of a pump; means for supplying both gas and liquid to said pump; and a conduit for conducting liquid to the system from a source so constructed and arranged as to both maintain a substantially constant supply of liquid in the system and also to cool the liquid before its delivery to said pump and including heat transfer means between a portion of said system and said conduit.

23. In combination, a system having means for directing a fluid along a course; a conduit for supplying cooling liquid to said system; and overflow means connected with said conduit whereby the quantity of liquid in the system is maintained constant.

17. A gas pumping system comprising the combination of a pump; means for supplying both gas and liquid to said pump; means for separating liquid from the mixture discharged from said pump; and means whereby gas dissolved by such separated liquid is recovered and such gas and separated liquid are returned to said pump.

24. In a gas pumping system, the combination of a pump connected between inlet and outlet conduits; an additional conduit for delivering liquid to the inlet of the pump, said additional conduit including a storage tank connected therein so as to be in heat exchange relation with another portion of said additional conduit.

18. A gas pumping system comprising the combination of a pump; means for supplying both gas and liquid to said pump; means for separating liquid from the mixture discharged from said pump, such separated liquid being returned to said pump; and a conduit so constructed and arranged as to maintain a constant supply of liquid in the system, a portion of said conduit being in heat exchange relation to another part of the system so as to cool the fluid therein before delivery to said pump.

25. In a gas pumping system, the combination of inlet and outlet conduits connected by a pump; means for supplying liquid to the system comprising a liquid supply conduit, connecting the system with a source of liquid supply; a portion of said liquid supply conduit being included in said system and in heat exchange relation with another portion of said liquid supply conduit.

19. A gas pumping system comprising the combination of a liquid reservoir; a pump; means for supplying both liquid, from said reservoir, and gas to said pump; means for separating liquid from the mixture discharged from the pump; means for returning the separated liquid to said reservoir; and a conduit leading from a

26. In combination with a gas circulating system, means exerting pressure on the gas for circulating it in said system, means for maintaining a constant supply of liquid in said system including a reservoir connected in said system and to a source of liquid supply by conduit means including an overflow.

27. In combination with a gas circulating system, means for circulating gas in the system; means for maintaining a substantially constant supply of liquid in the system and for cooling said liquid consisting of a conduit continuously connecting the system with a source of liquid supply; said conduit having a portion thereof in heat exchange relation to another portion; one portion being connected in the system and the conduit having an overflow outlet positioned to permit overflow of liquid when it rises in the system above the desired supply.

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CERTIFICATE OF CORRECTION.

Patent No. 1,991,548.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, lines 47 and 48, claim 3, strike out the words "distinct from the gas delivering means"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of April, A. D. 1935.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.