A. S. WHITE.

GAS PUMP.

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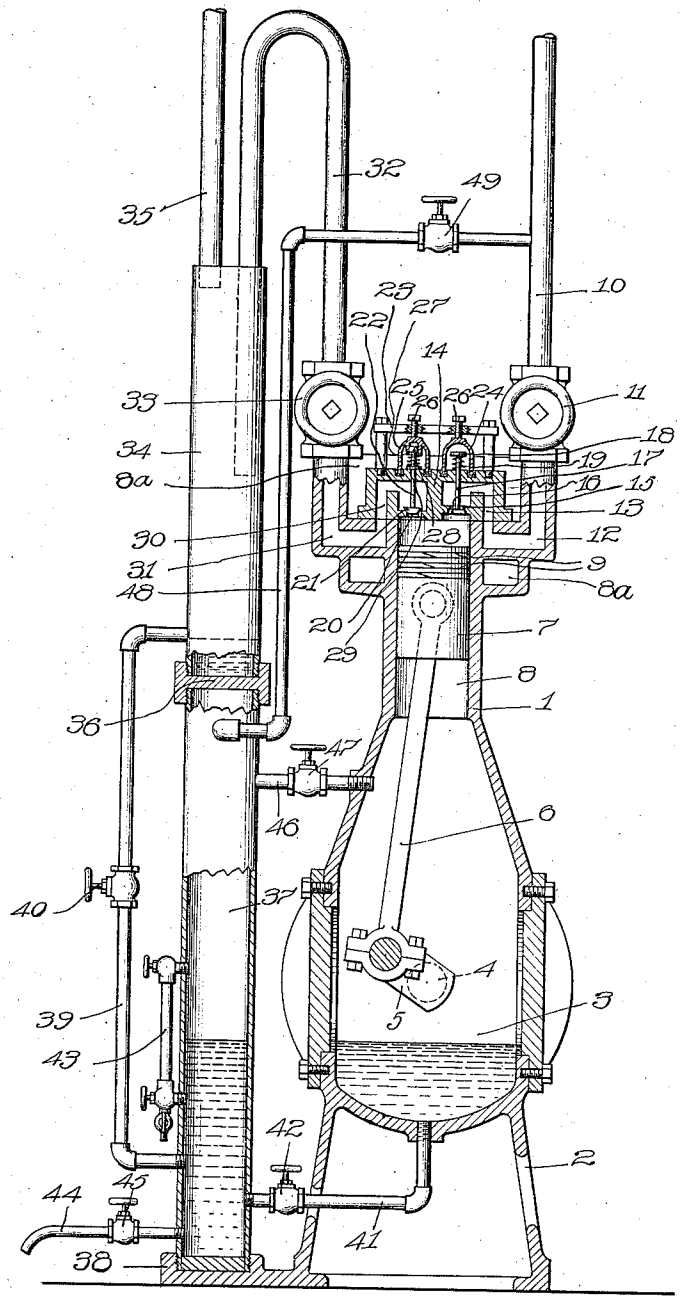

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GAS-PUMP.

977,690. Specification of Letters Patent. Patented Dec. 6, 1910.

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To all whom it may concern:

Be it known that I, ALFRED S. WHITE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Gas-Pumps, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to gas pumps and has particular reference to the oiling system used in connection with such pumps.

The type of pump to which my invention relates is used largely for pumping ammonia gas in connection with refrigerating operations. It is necessary that the bearings of such pumps should be thoroughly lubricated, and in order to effect this result it has been customary that a crank chamber should be provided, in which a considerable amount of oil is contained. On each revolution of the crank shaft the bearing between the crank and the connecting rod of the piston dips into the oil, and thorough lubrication is obtained.

It has been found that the oil in the crank chamber becomes heated to a considerable extent, and the result of this is that as the crank dips into the oil, a certain amount of foaming takes place. This foaming in itself is disadvantageous, and moreover it is obvious that much less satisfactory results are obtained by the use of such heated oil as a lubricant than would be obtained by the use of cold oil. It has also been found that in the case of ammonia and other gas pumps, a certain amount of oil inevitably passes by the piston which reciprocates within the cylinder, and this oil is mixed with the gas which is being pumped. It has been customary to provide a trap in the discharge pipe in order to collect this oil. A pipe has been used leading directly from this trap to the crank chamber, thereby returning the oil directly to the same. By this construction, however, the oil is not allowed to become cooled, and the foaming and use of hot oil mentioned above has been the inevitable result. At the same time, a certain amount of gas passes the piston, and for this reason it is necessary to have a closed crank chamber. Moreover, on account of the pungency of ammonia gas, all chambers or receptacles communicating with the crank chamber must be cut off from communication with the atmosphere.

According to my invention, the oil which is collected in the trap is drawn off periodically into a reservoir of considerable size which is in direct communication with the crank chamber, the oil in the reservoir and the crank chamber being at the same height. The connection between the reservoir and crank chamber is sufficiently above the bottom of the former so that any sediment which may pass from the trap into the reservoir does not pass into the crank chamber. This is a point of great superiority, inasmuch as by the old construction, where a pipe led directly from the trap to the crank chamber all the sediment passed directly into said chamber. An outlet is provided in connection with the reservoir so that the sediment collecting in the same may be withdrawn from time to time, as necessary. These and other advantages of my invention will be more apparent by reference to the accompanying drawing, which is an elevation and partly sectional view of the pump and its associated parts.

The pump 1 is mounted on the supports 2. Within the framework of the pump is provided a closed crank chamber 3, within which the crank shaft 4 is adapted to operate. The crank shaft 4 is provided with the crank 5, to which is attached, by suitable bearings, the connecting rod 6, the other end of which is connected to the piston 7 operating within the cylinder 8. The upper portion of piston 7 is provided with the packing rings 9 in order to prevent, as far as possible, communication between the portions of cylinder 8 above and below the piston 7. The cylinder 8 is surrounded at its upper portion by the water jacket 8^a, which serves to keep the gas which is being forced through the pump at a comparatively low temperature.

A suction pipe 10 communicates with a source of gas, for example, ammonia, which is to be pumped. In this suction pipe is provided a valve 11 for controlling the supply of gas. The suction pipe 10 communicates with passage 12 within the casing with which cylinder 8 is integral.

A passage 13 is provided within the cylinder head 14 and communicates directly with passage 12. An opening 15 connects passage 13 with the upper part of cylinder

8, this opening being closed by the valve 16, which is beveled and fits a corresponding bevel in opening 15. A valve stem 17 passes upwardly through the upper wall of cylinder head 14, and on its end is provided with a nut 18. A spring 19 incloses the valve stem and has its bearing on one end against the upper surface of the cylinder head 14, and on the other end against the nut 18 on the end of valve stem 17. Also communicating with the upper part of the cylinder 8 is the opening 20, which is closed by valve 21, the beveled edge of this valve being placed oppositely to the beveled edge of valve 16, mentioned above. The valve stem 22 passes upwardly through the upper wall of the cylinder head 14.

A bracket 23 is mounted on the cylinder head 14, and cups 24 and 25 covering the upper ends of valve stems 17 and 22 respectively are held in position against the gaskets in the annular grooves of the cylinder head 14 by means of set screws 26 passing through the bracket 23. On the inside of cup 25 is provided a boss 27. On the end of valve stem 22 a plunger 28 is mounted, this plunger being adapted to operate within a hole in the boss 27. A spring 29 bears on one end against the boss 27, and on its other end against the upper wall of the cylinder head 14.

Communicating with opening 19 is the passage 30 within the cylinder head 14. This passage communicates with a discharge passage 31 within the casing with which the cylinder head is integral. A discharge pipe 32 communicates with passage 31, the valve 33 being provided to regulate the discharge of gas, and being similar to valve 11 described above. Discharge pipe 32 passes into the trap 34, as indicated by the dotted lines, the pipe 35, also in communication with trap 34, serving to carry away the gas which is forced into the trap 34. The bottom of trap 34 is closed by the horizontal partition 36, below which is the oil reservoir 37 mounted on base 38. A pipe 39, provided with a valve 40, serves to establish communication between trap 34 and reservoir 37. A pipe 41 provided with valve 42 establishes communication between reservoir 37 and the bottom of crank chamber 3. The reservoir 37 is provided with a gage 43 in order to indicate the height of oil within the reservoir 37. Near the bottom of reservoir 37 is a discharge pipe 44 provided with a valve 45. The pipe 46, provided with valve 47, affords communication between the upper parts of the reservoir 37 and the crank chamber 3. A pipe 48, provided with valve 49, communicates between the upper part of reservoir 37 and the suction pipe 10.

The operation of my invention may now be clearly understood. When the pump is operated, the crank 5 and the lower end of connecting rod 6 dip into the oil within the crank chamber 3, and lubrication of the bearing is thus effected. As the piston 7 travels in a downward direction, provided the valves 11 and 33 are open, the gas is drawn through suction pipe 10 and passage 12 into passage 13. The suction is then effective in unseating the valve 16, and the gas passes into the portion of the cylinder 8 which is above the piston 7. As the piston travels upwardly, the valve 16 is seated and valve 21 is unseated, the gas thus being allowed to pass from the cylinder 8 into passage 30, and then through passage 31 into the discharge pipe 32. It has been found that a certain amount of oil inevitably passes from the crank chamber 3 past the piston 7 and is carried through the passages and discharge pipe 32 with the gas. This oil is separated from the gas in the trap 34 and collects in the bottom of the trap above the partition 36. The gas then passes outwardly through pipe 35. When the pump is started, a suitable amount of oil is provided in reservoir 37 and crank chamber 3, valve 42 being open and thus providing free communication between the chamber and the reservoir, the level of oil in both of these thereby being the same. As oil collects in the bottom of trap 34, this is periodically transferred to reservoir 37 by opening the valve 40, the sediment from the trap 34 being thereby carried into reservoir 37. The volume of oil in reservoir 37 is considerable, and for this reason it is possible to maintain the oil at a comparatively low temperature. When it is desired to withdraw the sediment from reservoir 37, valve 45 in pipe 44 is opened, and the sediment passes through this pipe.

In order to prevent the pressure in the crank chamber 3 from becoming excessive, pipe 46 is provided and the valve 47 is slightly opened in order to equalize the pressure in the crank chamber 3 and the reservoir 37. Inasmuch as the pressure in the crank chamber 3 and reservoir 37 is always the same, it follows that the level of oil in the chamber and reservoir will also be the same. Pipe 48, which connects with the suction pipe 10, is used for reducing the pressure in the reservoir 37 and also in the crank chamber 3. The valve 49 is also allowed to remain slightly open. The reduction in pressure takes place by withdrawing the gases from the reservoir 37 and crank chamber 3 through the pipe 48, and after these gases pass into the suction pipe 10 they again subsequently pass through the pump.

It is evident from the above description that my invention possesses many advantages, prominent among which are the withdrawal of the sediment from the oil by means of producing a suitable outlet in reservoir 37 and thereby preventing the contamination of the oil within crank chamber

3. By means of my invention it is also possible to keep the oil cool and thus prevent foaming.

What I claim as new and desire to cover by United States Letters Patent is:

1. In a gas pump, the combination of a lubricating chamber adapted to contain oil, a discharge pipe, a trap in said pipe for separating oil from the gas carried through said discharge pipe, an oil reservoir, means connecting said reservoir with said trap, and means connecting said reservoir with said lubricating chamber.

2. In a gas pump, the combination of a lubricating chamber adapted to contain oil, a discharge pipe, a trap in said pipe for separating oil from the gas carried through said discharge pipe, an oil reservoir, means connecting said reservoir with said trap, means connecting said reservoir with said lubricating chamber, and an outlet from said reservoir for drawing off sediment from the oil.

3. In a gas pump, the combination of a lubricating chamber adapted to contain oil, a discharge pipe, a trap in said pipe for separating oil from the gas carried through said discharge pipe, an oil reservoir, means connecting said reservoir with said trap, means connecting said reservoir with said lubricating chamber, and means for equalizing the pressure in the reservoir and the lubricating chamber.

4. In a gas pump, the combination of a suction pipe, a discharge pipe, a trap in said discharge pipe for separating oil from the gas discharged from the pump, an oil reservoir, means connecting said trap with said reservoir, a lubricating chamber, means connecting the reservoir with the lubricating chamber, and means connecting the reservoir with the suction pipe for decreasing the pressure in said reservoir.

5. In a gas pump, the combination of a suction pipe, a discharge pipe, a trap in said discharge pipe for separating oil from the gas discharged from the pump, an oil reservoir, means connecting said trap with said reservoir, a lubricating chamber, means connecting the reservoir with the lubricating chamber, means connecting the reservoir with the suction pipe for decreasing the pressure in said reservoir, and means for equalizing the pressure in said reservoir and said lubricating chamber.

6. In a gas pump, the combination of a suction pipe, a discharge pipe, a trap in said discharge pipe for separating oil from the gas discharged from the pump, an oil reservoir, means connecting said trap with said reservoir, a lubricating chamber, means connecting the reservoir with the lubricating chamber, means connecting the reservoir with the suction pipe for decreasing the pressure in said reservoir, and an outlet in the bottom of said reservoir for separating the sediment from said oil.

7. In a gas pump, the combination of a suction pipe, a discharge pipe, a trap in said discharge pipe for separating oil from the gas passing through said pump, an oil reservoir, means connecting said trap with said oil reservoir, a closed lubricating chamber, means for connecting said reservoir with said lubricating chamber to allow the free passage of oil, means connecting the upper parts of the reservoir and the lubricating chamber to allow equalization of pressure, thereby causing the oil in the reservoir and lubricating chamber to be at the same level, and means connecting the upper part of said reservoir with the suction pipe, thereby decreasing the pressure in the reservoir and lubricating chamber and returning gas to the suction pipe.

8. In a gas pump, the combination of a suction pipe, a discharge pipe, a trap in said discharge pipe for separating oil from the gas passing through said pump, an oil reservoir, means connecting said trap with said oil reservoir, a closed lubricating chamber, means for connecting said reservoir with said lubricating chamber to allow the free passage of oil, means connecting the upper parts of the reservoir and the lubricating chamber to allow equalization of pressure, thereby causing the oil in the reservoir and lubricating chamber to be at the same level, means connecting the upper part of said reservoir with the suction pipe, thereby decreasing the pressure in the reservoir and lubricating chamber and returning gas to the suction pipe, and means for separating the sediment from the oil in said reservoir, thereby preventing the return of said sediment to the lubricating chamber.

9. In an ammonia pump, the combination of a cylinder, a piston adapted to reciprocate within said cylinder, a crank shaft, a connecting rod from said crank shaft to said piston, a closed crank chamber adapted to contain oil for lubricating the bearing between said connecting rod and the crank on said crank shaft, a suction pipe, a discharge pipe, a trap in said discharge pipe for separating the oil from the ammonia, an oil reservoir, means connecting said trap with said reservoir to allow the periodic passage of oil therethrough, means connecting the reservoir with the crank chamber to allow the passage of oil, means connecting the upper portions of the reservoir and crank chamber to effect an equalization of pressure, thereby causing the oil in the reservoir and crank chamber to assume the same level, means connecting the upper portion of said reservoir with the suction pipe to cause a reduction in pressure in the reservoir and crank chamber, and means for separating the sediment from the oil in said reservoir.

10. In a gas pump, the combination of an inclosed crank chamber adapted to contain oil, a separate oil reservoir connected with said crank chamber below the level of the oil, and a pressure-equalizing passage between the crank chamber and the reservoir above the normal level of the oil.

11. In a gas pump, the combination of an inclosed crank chamber adapted to contain oil, an oil reservoir connected with said crank chamber below the level of the oil, a gas supply pipe, a pressure-relieving passage between the gas supply pipe and said reservoir, and a pressure-relieving passage between the crank chamber and said reservoir.

12. In a gas pump, the combination of an inclosed crank chamber adapted to contain oil, an oil reservoir, a connection from the bottom of said crank chamber to a point above the bottom of said oil reservoir, a pressure-equalizing connection between said crank chamber and said reservoir above the level of the oil, and a connection from the upper portion of the oil reservoir to the gas-supply pipe of the pump.

In witness whereof, I hereunto subscribe my name this 8th day of December, A. D. 1909.

ALFRED S. WHITE.

Witnesses:
HENRY M. HUXLEY,
J. S. ABBOTT.