G. C. HICKS, Jr.

REGULATOR FOR GAS WORKS.

APPLICATION FILED MAY 1, 1911.

1,008,334.

Patented Nov. 14, 1911.

2 SHEETS—SHEET 1.

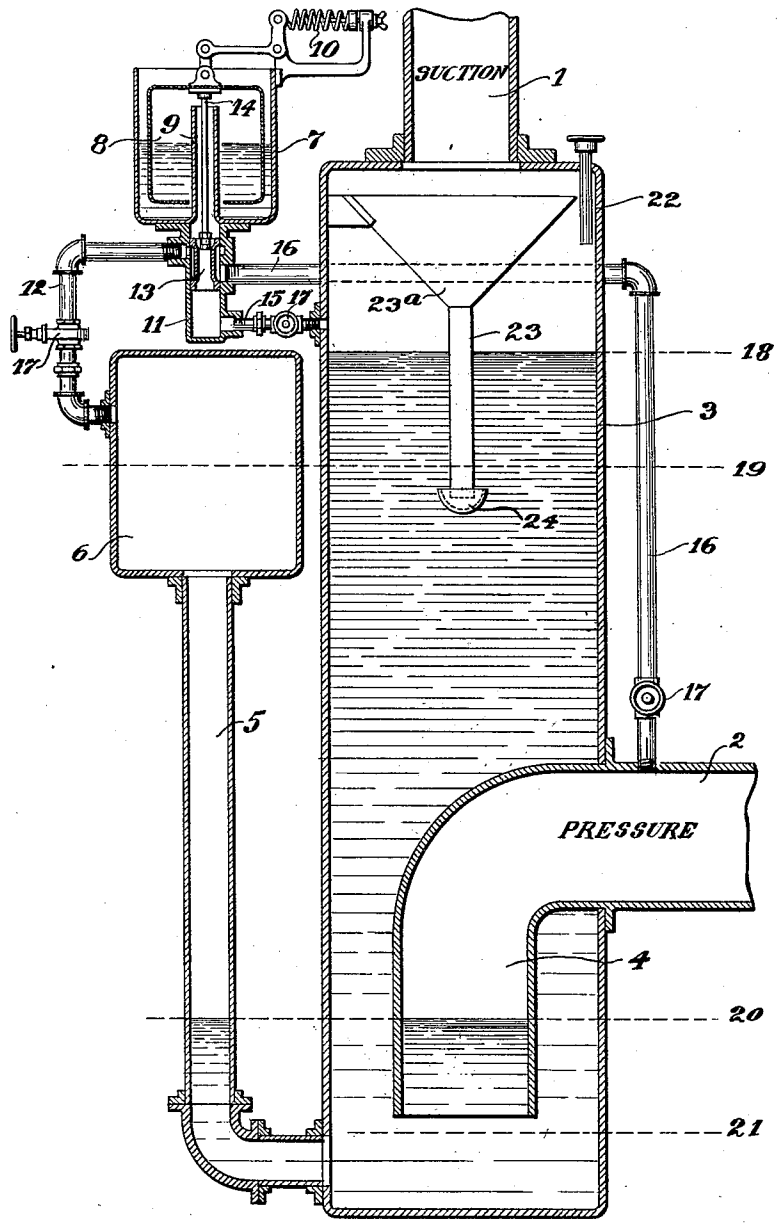

Fig. 1.

Witnesses

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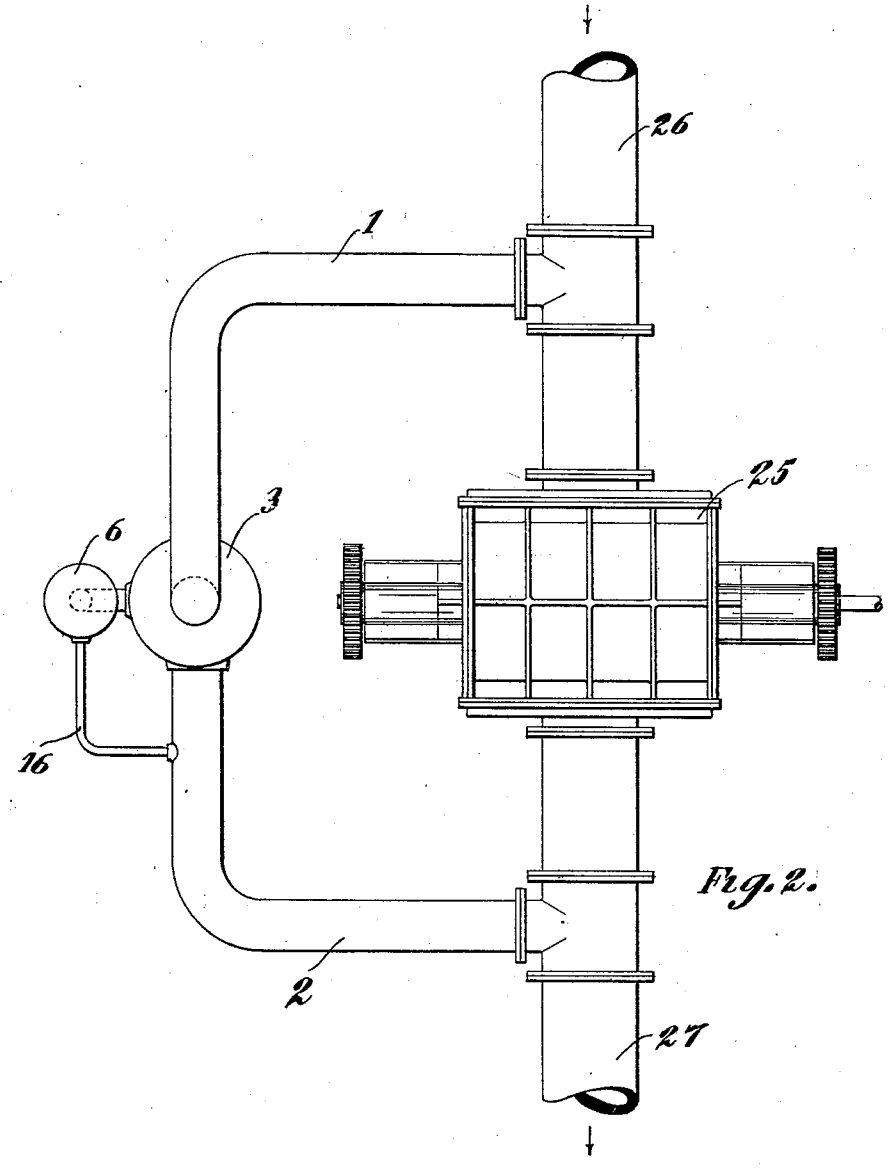

Fig. 2.

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UNITED STATES PATENT OFFICE.

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REGULATOR FOR GAS-WORKS.

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To all whom it may concern:

Be it known that I, GEORGE C. HICKS, Jr., a citizen of the United States, residing at Connersville, Fayette county, Indiana, have invented certain new and useful Improvements in Regulators for Gas-Works, of which the following is a specification.

In the operation of large gas works and by-product coke works, and in certain other situations dealing with gas, a gas pump sucks the gas at low or zero pressure and delivers it into a main at higher pressure, the pump therefor being disposed between the suction and pressure sections of the main. It is desirable that the pressure in the pressure main shall not exceed the normal beyond a certain limit, and this matter has usually been taken care of either by providing the pressure main with a loaded relief valve, or by providing the pressure main with a water-sealed outlet, the valve or water-seal opening when the pressure in the pressure-main passes the desired limit, the escaping gas venting to the atmosphere or back into the suction main through a by-pass. It is also desirable that, in order to prevent the opening of water-seals connected with the suction-main, the pressure in the suction main should not be permitted to fall, within proper limits, below the normal, and this matter has been taken care of by arranging a by-pass from the pressure-main to the suction main, past the pump, and disposing therein a normally closed valve automatically opening when the suction pressure drops to an improper degree, thus permitting pressure to flow from the pressure main to the suction main. In such arrangement the valve would require to be as large as the by-pass, and as some of these by-passes would be in the neighborhood of two feet in diameter a by-pass valve of corresponding size would be required and the pressure-controlled motor operating the valve would require to be correspondingly large and powerful, and these large valves have, owing to the difficulty in operating them and to their tendency to stick, been a source of considerable trouble.

In my present invention I cause one apparatus to act as a relief device for the pressure main and as a by-pass for the suction main and I dispense entirely with a valve in the by-pass, the apparatus being operated by a very small valve having pilot duty only and capable of being actuated by a very small pressure-controlled motor.

My invention will be readily understood from the following description taken in connection with the accompanying drawings in which—

Figure 1 is a vertical section of an apparatus constituting one embodiment of the invention, which invention, however, is susceptible of embodiment in many specific forms, and Fig. 2 a plan, partly diagrammatic, indicating a system of connecting my apparatus into the main.

In the drawing:—1, indicates a portion of the by-pass adapted to be connected with the suction main at the suction side of the pump: 2, a portion of the by-pass adapted to be connected with the pressure main at the pressure side of the pump: 3, a main tank forming an intermediate portion of the by-pass: 4, a dip-pipe within the tank and forming the inner end of the pressure portion of the by-pass: 5, a vertical pipe connected with the base of the main tank: 6, a secondary tank connected with pipe 5 and forming an enlargement thereof, an expedient to avoid the necessity for making the entire pipe 5 of large size: 7, an open-topped float-chamber, containing water: 8, a float disposed in the float-chamber, the float being hollow: 9, a fixed hollow stem projecting up into the float through the floor of the float which it fits so loosely as to provide a space around it: 10, an adjustable spring aiding in the support of the float: 11, a valve-chamber: 12, a pipe leading from secondary tank 6 to a port communicating with the valve-chamber: 13, a hollow valve working in the valve-chamber: 14, a stem connecting the valve with the float: 15, a pipe connecting the upper portion of main tank 3 with the interior of the float, the connection being, in the example, through the hollow of the valve and through stem 9: 16, a pipe leading from pressure portion 2 of the by-pass to the valve-chamber, the valve normally placing pipes 16 and 12 in communication with each other and being adapted, by the downward movement of the float, to cut off such communication: 17, emergency valves placed in the several pipes: 18, a line indicating a certain water level: 19, a line indicating another water level: 20, a line indicating another water level: 21, a line indicating another water level: 22, a closed

filling-pipe for the main tank: 23, a drain-pipe disposed below the lower end of the suction portion 1 of the by-pass: 23a, funnel on the upper end of the drain-pipe: and 24, an inverted cup or trap at the lower end of the drain pipe: 25, an exemplifying pump for producing pressure in the main: 26, the suction main leading thereto: and 27 the pressure main leading from the pump.

Assume the apparatus to be employed in a system in which the pressure in the pressure main 27 is normally three pounds per square inch it being the duty of the apparatus to guard against this pressure rising above three and one-half pounds, and in which the pressure in the suction main 26 is zero, by gage, and is not to fall sufficiently below zero to open such water seals as may be connected with the suction main. Let the vertical distance between water levels 20 and 18 represent a head of water equal to three pounds pressure per square inch. It follows that the pressure in pressure pipe 2 will maintain the water level in the main tank at the level 18 and will maintain the level in dip-pipe 4 and pipe 5 at level 20, it being understood that the gas at three pounds pressure is above the water in pipe 5. The by-pass, considered as a whole, is thus closed. Spring 10 is to be so adjusted as to put the float in equilibrium of forces when the valve is in the open position indicated in the drawing, that is to say, putting pressure-pipe 2 in communication with the upper end of pipe 5. If, now, the pressure in the pressure main unduly rises then the water will be forced down until dip-pipe is unsealed, so to speak, or until gas passes from it and rises through the water in the main tank and goes to the suction. When the pressure in the pressure-main becomes normal, then the water lowers in the main tank and rises in the dip-pipe and seals the dip-pipe against any further passage of gas from the pressure main to the suction main. As the gas thus passing up through the water in the main tank to the suction portion of the by-pass tends to carry water entrained with it, funnel 23a acts as a separator, and the water falling from the gas moves down through the drain-pipe and into the body of water in the main tank, trap 24 on the lower end of the drain-pipe preventing upward currents of gas entering the drain-pipe and interfering with the free down flow of the water separated from the gas.

Normal suction pressure, coming through pipe 15, plus the tension of spring 10, plus the elevating effect the water may have upon the float, holds the valve in the normal position indicated in the drawing, placing the pressure main in communication with the top of pipe 5, and spring 10 is to be adjusted to bring about such normal position for the valve, whereby pressure from the pressure main holds the water in pipe 5 to the level 20, the level it is at in dip-pipe 4. If, now, the pressure in the suction main unduly falls, then the supporting effect on the float becomes lessened and the float descends and cuts off the pressure of the pressure main from the top of pipe 5, and the top of pipe 5 will be placed in communication with the upper portion of the tank which is at present suction pressure. Thereupon the water will descend in the main tank and rise in pipe 5, say to the level 19, and the lower end of the dip-pipe will lose its water, and gas from the pressure main will go up through the water in the main tank and therefrom to the suction main. When the pressure in the suction main reaches the normal then its increased lifting effect upon the float will again elevate the valve to normal position, and pressure from the pressure main will again become active on the water in pipe 5 and the water in that pipe and the dip-pipe will again find the level 20, or such level as will effectually seal the dip pipe and prevent any further flow of gas through the by-pass.

Providing pipe 5 with a secondary tank 6, which secondary tank may be at any point in the length of pipe 5, permits of pipe 5 being made comparatively small. The floor of float 8 has an aperture around stem 9 so much larger than the stem as to permit of restrained passage of water as the float rises and falls in the float chamber, the float thereby acting on the dashpot principle and avoiding jerking or hunting actions of the valve.

It is to be understood that the float arrangement is merely one exemplification of a pressure-controlled motor for actuating the valve so as to place pipe 5 in communication with either the suction main or pressure main.

In the particular embodiment which I have chosen for the purpose of illustrating my invention I have assumed upon the employment of water in forming the liquid seal of the by-pass, and in practice water will be the liquid usually employed. But the employment of a liquid as light as water necessarily involves apparatus of a very considerable size. By the employment of a heavy liquid, such as mercury, for the seal, the apparatus may be very materially reduced in size. It is to be understood that I have simply explained the principle of my invention and have set forth the best form in which I at present contemplate embodying it.

I claim:—

1. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a tank, a suction connection to the upper portion thereof, a pressure connection terminating in a dip-pipe in the lower portion of the

tank, a side-pipe communicating with the base of the tank, and means for placing the side pipe in communication with either the suction connection or pressure connection, combined substantially as set forth.

2. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a tank, a suction connection to the upper portion thereof, a pressure connection terminating in a dip-pipe in the lower portion of the tank, a side-pipe communicating with the base of the tank, conduits placing the upper end of the side-pipe in communication with the suction connection and the pressure connection, a valvular device in said conduits adapted to place the upper end of the side-pipe in connection with either the pressure connection or the suction connection, a pressure-controlled motor connected with said valvular device to shift the valve under changes of pressure in the by-pass, and means for holding the valve in a normal position to place the side-pipe in communication with the pressure connection, combined substantially as set forth.

3. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a tank, a suction connection to the upper portion thereof, a pressure connection terminating in a dip-pipe in the lower portion of the tank, a side-pipe communicating with the base of the tank, conduits placing the upper end of the side-pipe in communication with the suction connection and the pressure connection, a valvular device in said conduits adapted to place the upper end of the side-pipe in connection with either the pressure connection or the suction connection, a pressure-controlled motor connected with said valvular device to shift the valve under changes of pressure in the by-pass, means for holding the valve in a normal position to place the side-pipe in communication with the pressure connection, and an adjusting device to regulate the resistance of the valvular device in being shifted, combined substantially as set forth.

4. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a liquid-seal forming a portion of the by-pass and serving to seal the pressure connection from the suction connection, a pipe communicating with the base of the liquid seal, and means for admitting to said pipe the pressure from either the suction or supply connection of the by-pass, combined substantially as set forth.

5. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a liquid-seal forming a portion of the by-pass and serving to seal the pressure connection from the suction connection, an automatic pipe communicating with the base of the liquid seal, and means for admitting to said pipe the pressure from either the suction or supply connection of the by-pass, combined substantially as set forth.

6. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a liquid-seal forming a portion of the by-pass, a pipe communicating with the base of the liquid-seal and normally communicating with the pressure connection of the by-pass, a valve for closing the communication between said pipe and the pressure connection and placing it in communication with the suction connection, and a pressure-controlled motor for shifting said valve, combined substantially as set forth.

7. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a tank, a suction connection to the upper portion thereof, a pressure connection terminating in a dip-pipe in the lower portion of the tank, a side-pipe communicating with the base of the tank, conduits placing the upper end of the side-pipe in communication with the suction connection and the pressure connection, a valvular device in said conduits adapted to place the upper end of the side-pipe in connection with either the pressure connection or the suction connection, a pressure-controlled motor connected with said valvular device to shift the valve under changes of pressure in the by-pass, means for holding the valve in a normal position to place the side-pipe in communication with the pressure connection, and a drain-pipe separator disposed in the upper portion of the tank below the suction connection thereto, combined substantially as set forth.

8. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a tank, a suction connection to the upper portion thereof, a pressure connection terminating in a dip-pipe in the lower portion of the tank, a side-pipe communicating with the base of the tank, conduits placing the upper end of the side-pipe in communication with the suction connection and the pressure connection, a valvular device in said conduits adapted to place the upper end of the side-pipe in connection with either the pressure connection or the suction connection, a pressure-controlled motor connected with said valvular device to shift the valve under changes of pressure in the by-pass, means for holding the valve in a normal position to place the side-pipe in communication with the pressure connection, a funnel disposed in the upper portion of the tank below the suction connection thereto, and a drain-pipe depending from the funnel, combined substantially as set forth.

9. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a tank, a suction connection to the upper portion thereof, a pressure connection terminating in a dip-pipe in the lower portion of the tank, a side-pipe communicating with the

base of the tank, conduits placing the upper end of the side-pipe in communication with the suction connection and the pressure connection, a valvular device in said conduits adapted to place the upper end of the side-pipe in connection with either the pressure connection or the suction connection, a pressure-controlled motor connected with said valvular device to shift the valve under changes of pressure in the by-pass, means for holding the valve in a normal position to place the side-pipe in communication with the pressure connection, a funnel disposed in the upper portion of the tank below the suction connection thereto, a drain-pipe depending from the funnel, and a trap on the lower end of the drain-pipe, combined substantially as set forth.

10. A gas-pressure regulator for a by-pass around a gas-pump, comprising, a tank, a suction connection to the upper portion thereof, a pressure connection terminating in a dip-pipe in the lower portion of the tank, a side-pipe communicating with the base of the tank, a secondary tank connected with the side pipe, conduits placing the upper end of the side-pipe in communication with the suction connection and the pressure connection, a valvular device in said conduits adapted to place the upper end of the side-pipe in connection with either the pressure connection or the suction connection, a pressure-controlled motor conected with said valvular device to shift the valve under changes of pressure in the by-pass, and means for holding the valve in a normal position to place the side-pipe in communication with the pressure connection, combined substantially as set forth.

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