

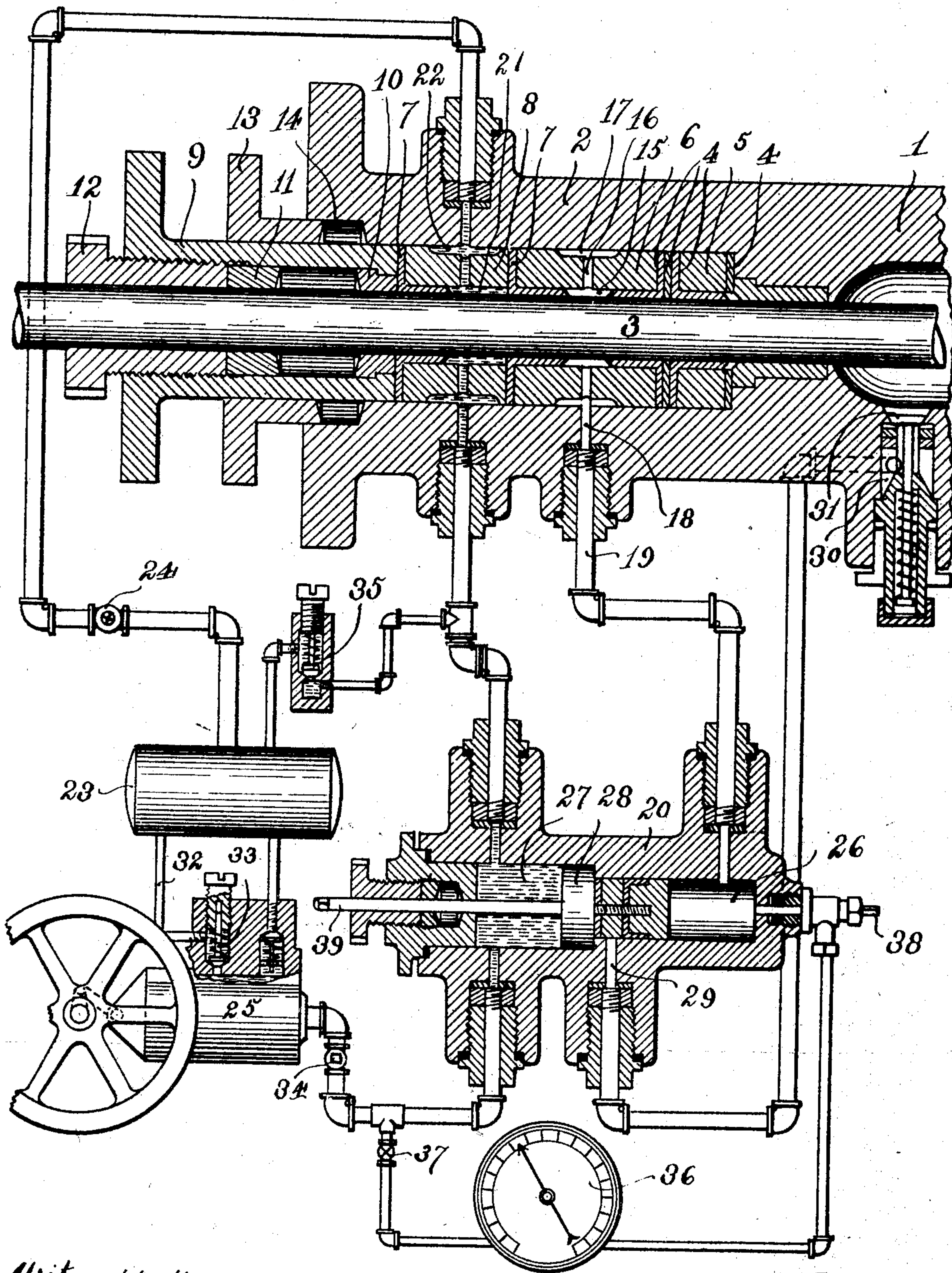
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PATENTED FEB. 3, 1903.

J. C. GOOSMANN.  
REFRIGERATING MACHINE.

APPLICATION FILED OCT. 24, 1901.

NO MODEL.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## REFRIGERATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 719,460, dated February 3, 1903.

Application filed October 24, 1901. Serial No. 79,813. (No model.)

*To all whom it may concern:*

Be it known that I, JUSTUS C. GOOSMANN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Refrigerating - Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a novel construction in an ice-machine, and more particularly to stuffing-boxes for ice-machines, the object being to provide means for effectually preventing loss of gas; and it consists in the features of construction and combinations of parts hereinafter fully described and claimed.

The accompanying drawing, illustrating my invention, shows the end of the high-pressure cylinder and stuffing-box in section and parts connected with said cylinder and stuffing-box partly in section and partly in elevation.

My invention is particularly designed for that class of ice-machines in which carbonic-acid gas is used; and its object is, as above stated, to minimize the loss of gas through the stuffing-box.

The cylinder 1 is provided with a stuffing-box 2, through which the piston-rod 3 passes. Said stuffing-box is provided at its inner end with a plurality of packing-rings 4, held in place by the metallic rings 5 and 6, and outwardly of the latter are two more packing-rings 7, held in place partly by said ring 6 and partly by the ring 8 and gland 9. The latter contains rings 10 and 11, between which packing is interposed, which said packing is compressed by means of a sleeve 12, threaded into the outer end of said gland 9. Said gland 9 passes through a sleeve 13, entering an annular recess 14 in the end of said stuffing-box 2, and is adapted to compress a packing in said annular space.

In this class of machines a very high pressure is attained in the cylinder 1, thereby making the prevention of loss of gas exceedingly difficult. The usual means employed consist in providing the stuffing-box 2 with a gas-chamber intermediate of the inner and outer packing-rings and with a glycerin-

chamber outwardly of the gas-chamber, such glycerin serving the double purpose of effecting a seal within the stuffing-box and lubricating the piston-rod. Such gas-chamber is generally connected with the suction end of the cylinder, so that escaping gas will be returned into the system. In order to effectively form a seal within the stuffing-box, the glycerin is maintained at a pressure greater than the suction and less than the high pressure, so as to prevent the gas from bubbling through the glycerin. The means heretofore employed, however, have been only partially successful in preventing loss of gas, but not to a sufficient extent to effect superior economy over the anhydrous-ammonia machines.

The main cause of inefficiency appears to lie in the fact that no means are provided for ascertaining positively whether the correct pressures are maintained in the gas-exhaust and glycerin chambers relatively to each other and the high-pressure end of the cylinder and that no means for automatically maintaining the required pressure in the glycerin-chamber are provided. As the glycerin is being constantly consumed, the pressure of same unless maintained automatically must undergo constant reduction, and when less than the pressure in the exhaust-gas chamber the escape of gas follows.

Another detrimental feature generally found in machines of this class is that a check-valve is interposed between the gas-exhaust chamber of the stuffing-box and the suction end of the cylinder, such valve having differential areas, so that the pressure in the exhaust-chamber must reach a point sufficiently greater than the suction pressure to overcome the load exerted by the latter on the larger valve area when such valve opens automatically and relieves the pressure. Such valve cannot, however, be relied upon, as it is necessarily very delicate and susceptible to any influence which ordinarily affects valves, and owing to its necessarily isolated position it cannot be determined whether such valve operates at all.

Between the outermost packing-ring and innermost ring 7 is left an annular space 15, connected by ducts 16 with an annular chamber 17, formed in the ring 6. Said annular

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chamber 17 is connected, by means of a duct 18 and pipe 19, with one end of a cylinder 20, hereinafter described. A similar annular space 21 is formed between the packing-rings 7, and this is similarly connected with an annular chamber 22, connected with the other end of said cylinder 20 and with a glycerin-tank 23, a valve 24 being interposed in the pipe effecting the last-named connection. Said tank 23 is connected with the suction end of a glycerin-pump 25, the delivery end of said pump being connected with the last-named end of said cylinder 20. Said cylinder 20 is divided longitudinally into two differential chambers 26 and 27, separated by the differential piston 28, the smaller chamber 26 of said cylinder forming the gas-chamber and the larger forming the glycerin-chamber 27. Said piston 28 also acts as a valve to control a gas-exhaust port 29, leading to a valve-chamber 30, connected with the cylinder 1, said valve-chamber 30 containing a suction-valve 31, actuated by fluid-pressure in one direction and by a spring in the other direction.

The pump 25 may be either a hand or power pump; but for the present I will presume that it is a continuously-working power-pump arranged to maintain a constant pressure in the chambers 27 and 21 and maintain a constant circulation of the glycerin. The maintenance of constant pressure is readily effected by setting the valve 24 so as to provide sufficient resistance to the flow of glycerin. The cylinder of said pump 25 also has a return connection 32 with said tank 23, which is controlled by a spring-actuated valve 33, which acts as a safety-valve to relieve excess pressure.

We will assume that the highest pressure developed in the cylinder 1 is seventy atmospheres and the glycerin-pressure maintained is thirty-seven atmospheres. The valve 33 would be set to open when the glycerin-pressure exceeds thirty-seven atmospheres. The pressure exerted on the larger face of the piston 28 would equalize a pressure of sixty-five atmospheres on the smaller end of said piston 28. Hence when the pressure of the escaping gas in the stuffing-box chamber 17 exceeds sixty-five atmospheres the piston 28 will be moved to uncover the exhaust-port 29 and permit the gas to return into the cylinder 1 in an obvious manner.

A check-valve 34 is interposed in the pipe connecting the delivery end of the pump 25 with said cylinder 20 to prevent reflux of glycerin, and in order to permit the piston 28 to move to uncover the port 29 I provide a return connection from the pipe connecting the cylinder 20 with the annular chamber 22, a pop-valve 35 being interposed in said connection, which may be adjusted to open when the glycerin-pressure exceeds thirty-seven atmospheres. As soon as said glycerin-pressure exceeds thirty-seven atmospheres the valve 33 will be opened and the glycerin pumped

will return directly into the tank 23 until such excess pressure is again relieved by escape of gas from the chamber 26 into cylinder 1. A branch pipe extends from any convenient point in the glycerin system to a pressure-gage 36, and a similar pipe connects said chamber 26 of cylinder 20 with said pressure-gage, each of said connections being controlled by valves 37 and 38, respectively. By this means the glycerin-pressure can be ascertained when desired by opening valve 37 and closing valve 38, and by reversing such operation the pressure in chamber 26 can be read.

The piston 28 is provided with a piston-rod 39, which projects from the cylinder 20, whereby it can readily be determined whether the system operates properly and what the degree of leakage is.

I claim as my invention—

1. In a refrigerating or ice machine, the combination with the compressor-cylinder and a stuffing-box at one end of same, of a gas-chamber in said stuffing-box, a glycerin-chamber in same, a glycerin-tank, a pipe connecting same with said glycerin-chamber, a pump connected with said tank at its suction end, a cylinder having differential chambers, a differential piston therein, connection between one of said chambers and said pump, and with said glycerin-chamber, connection between the other chamber of said cylinder with said gas-chamber, connection between said cylinder and the compressor-cylinder, said differential piston controlling said last-named connection, connection between said glycerin-chamber of said cylinder and said glycerin-tank, and a pop-valve interposed in said connection, whereby when the gas-pressure in said gas-chamber exceeds a given point, said pop-valve will open and return the glycerin to said tank until said differential piston has moved to establish connection between said gas-chamber and the compressor-cylinder to return escaped gas to the latter.

2. In a machine of the kind specified, the combination with the compressor-cylinder, the stuffing-box, an escape-gas chamber, a glycerin-chamber, a glycerin pump and tank adapted to maintain a given pressure in the glycerin-chamber and a constant circulation of same, and connection between said escape-gas chamber and the compressor-cylinder other than through said stuffing-box, of a cylinder having differential chambers interposed in said glycerin system and in said last-named gas connection and having a differential piston controlling the latter, said piston being actuated by variations in pressure in the escape-gas chamber against the action of the glycerin-pressure to establish connection between said escape-gas chamber and said compressor-cylinder, and a pop-valve connection between said glycerin-chamber and said tank for returning glycerin displaced by the movement of said piston into said tank.



3. In a machine of the kind specified, the  
combination with the compressor-cylinder,  
the stuffing-box, an escape-gas chamber in  
said stuffing-box, a valve-chamber on said  
5 compressor-cylinder, a suction-valve therein,  
and connection between said valve-chamber  
and said gas-escape chamber, of a glycerin-  
chamber in said stuffing-box, means for main-  
taining a given pressure therein, and devices  
10 controlled by said glycerin-pressure and inter-

posed in said connection between said escape-  
gas chamber and said valve-chamber for con-  
trolling said connection.

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

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