Jan. 24, 1933. C. PICARD 1,895,295

APPARATUS FOR THE DISTRIBUTION OF GASES UNDER PRESSURE BY MEANS OF LIQUEFIED GASES

Filed Dec. 18, 1928 2 Sheets-Sheet 1

Fig. 1

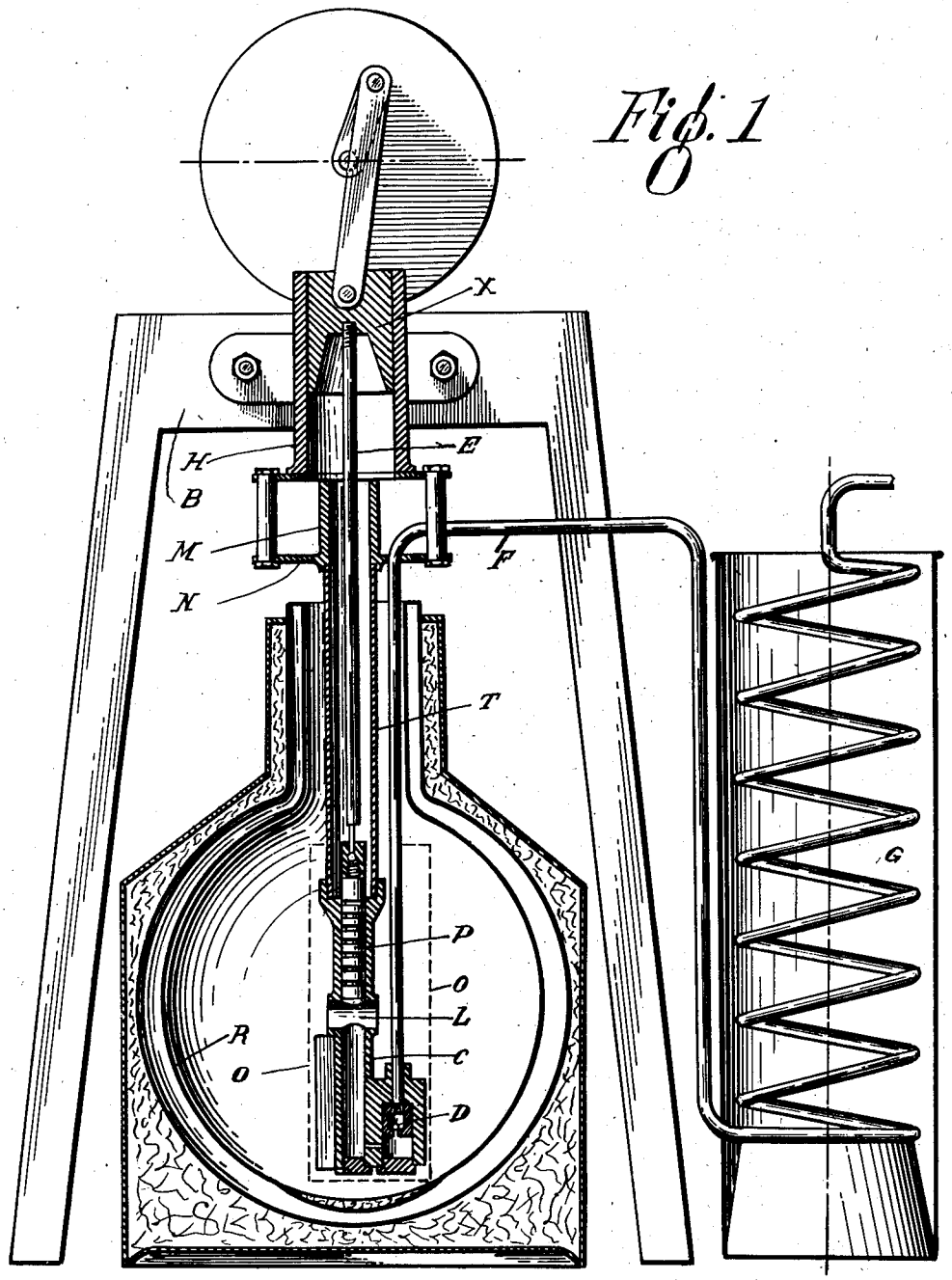

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Fig. 2

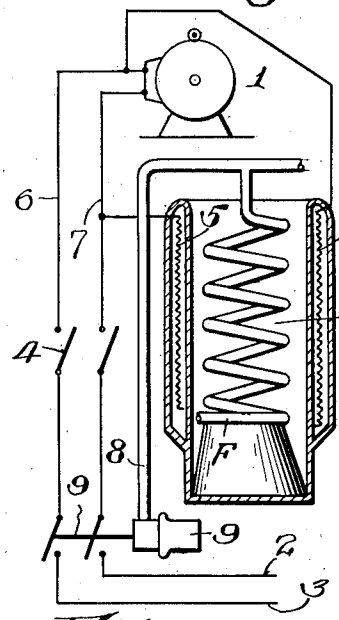


Fig. 4.

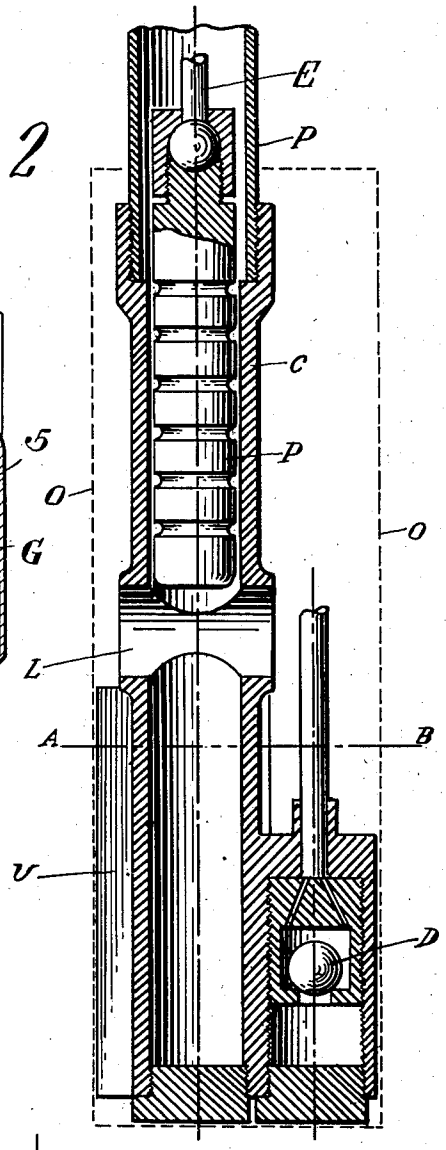
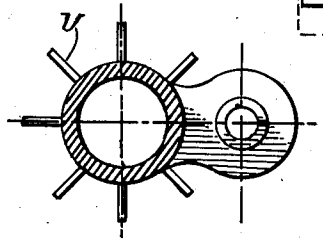


Fig. 3



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Patented Jan. 24, 1933 1,895,295

UNITED STATES PATENT OFFICE

CHARLES PICARD, OF JOINVILLE LE PONT, FRANCE, ASSIGNOR TO L'AIR LIQUIDE SOCIÉTÉ ANONYME POUR L'ETUDE & L'EXPLOITATION DES PROCEDES GEORGES CLAUDE, OF PARIS, FRANCE

APPARATUS FOR THE DISTRIBUTION OF GASES UNDER PRESSURE BY MEANS OF LIQUEFIED GASES

Application filed December 18, 1928, Serial No. 326,895, and in France December 20, 1927.

This invention relates to methods and apparatus for distribution of gases under pressure by means of liquefied gases, for example for distributing gaseous oxygen under pressure by means of liquid oxygen.

The arrangements heretofore proposed for such a distribution of oxygen necessitate an apparatus from which certain dangers may arise on account of the pressure developed therein by the vaporization of the liquid oxygen itself and further on account of the impossibility of preventing the entrance of heat from the exterior so that a spontaneous vaporization cannot be prevented when gaseous oxygen is not withdrawn with the resulting possibility of an increase of the pressure beyond permissible limits.

The present invention has for its object to obviate the disadvantages above referred to. For this purpose according to the invention the liquefied gas is introduced into containers under no or almost no pressure and is converted, near the place where it is to be used, into gas under pressure by means of a liquid pump and a vaporizer.

Preferably the pump is located in the container and discharges into the vaporizer; consequently, as the pressure is created by the pump, this pressure, and the parts of the apparatus to which it is applied, can be controlled; when the pump is not working, these latter may be limited to a simple receptacle of the usual character filled with gas at a pressure of about 150 kilograms per square centimetre.

Another feature of the present invention consists in the special construction of the force pump for the liquefied gas as will be described hereinafter.

In order that the said invention may be clearly understood and readily carried into effect the same will be more fully described with reference to the accompanying drawings which illustrate diagrammatically and by way of example an apparatus for carrying out the present method, and in which:—

Figure 1 is a view of the plant as a whole,

Figure 2 a detail view of the pump, and

Figure 3 a section on the line A—B of Figure 2.

R is a container for the liquefied gas in which it is transported or which is permanently located at the place where it is to be used. Into this container there is introduced through the part open to the air a pump carried on the frame B and consisting of two main parts: the compression cylinder and the mechanism controlling the piston; these two parts are connected together by tubes or rods preferably of metal of poor heat conductivity and of dimensions as small as possible in order to reduce the calorific capacity thereof. Only the compression cylinder C dips into the liquefied gas, the control mechanism being completely outside the receptacle R. This cylinder C is connected to the pump control mechanism by means of a thin tube T preferably made of a metal of poor heat conductivity. In the cylinder C reciprocates a plunger piston P, preferably provided with grooves, and connected to the sliding guide head X by a thin rod or a tube E, which is also preferably made of a metal which is a poor conductor of heat. The piston P may be metallic or constructed of plastic materials such as a series of discs of dressed leather, etc.

The cylinder C is provided with ports L which are uncovered by the piston when the latter is at the top of its suction stroke; these ports allow of the escape of the gas which might be present in the cylinder, and thus prevent the draining of the pump. These ports may replace the suction valve, but they are also efficient in a cylinder provided with such valve.

It has furthermore been found necessary, in order to ensure a good output from the pump, to cool the body of the same, as heat might be disengaged by friction and by the compression of the liquid, thereby causing the formation of gas in sufficient quantity to interfere with the working. For this purpose the cylinder C is provided with gills U of sufficient surface to dissipate the heat developed in the body of the pump and thus prevent vaporization of the liquid in the interior of the cylinder C.

The pump is provided at its lower part with a discharge valve the seat of which is prefer-

ably made of slightly plastic material, such as fibre which has been recognized as providing a tight joint, or of pure copper; the valve may be constituted by a simple ball.

It is also necessary to avoid the introduction of any solid particles into the pump, as in consequence of the very low temperatures and the absence of lubrication, these particles would at once cause a seizure. For this purpose the inlet ports are covered with very fine metallic gauze C capable of stopping the particles of ice and solid carbon dioxide generally found in liquid oxygen.

A sleeve M of smaller diameter than the guide H and a flat part N prevent the lubricating oil from the slide falling into the cylinder C and into the container R.

The liquid from the container R, drawn in by the piston P, enters the cylinder C through the ports L, and is forced through the valve D into a pipe F made of metal of poor heat conductivity which leads into a vaporizer G, where the liquid is converted into gas, this vaporizer G being maintained at the required temperature by any desired method of heating. The gas thus produced passes under pressure to the place where it is to be used or stored.

A convenient method of effecting this heating, when the pump is worked electrically, consists in passing the current through a heating resistance situated in the vaporizer and which only acts when the pump is working, being automatically cut out of the circuit on the stoppage of the pump.

According to this method the electric current is supplied to the motor 1 actuating the pump from the source of power 2—3 through a switch 4; the heating resistance 5, situated in the wall of the vaporizer G, is shunted on the circuit of the pump at 6—7, after the switch 4, so that this switch, when turned on, supplies the current simultaneously to the motor 1 and to the heating resistance.

When the desired pressure in the distributor pipe 8 of compressed gas has been reached. this pressure actuates automatically a switch 9 which cuts off the current supply to the pump and to the heating resistance.

The pressure of the gas may be as high as desired; if it is necessary to maintain a pressure approximately constant in the supply pipes, there may be attached to the pump an automatic starter which starts the pump working when the pressure in the pipes tends to drop and which stops it when the pressure is sufficiently high.

I claim:

1. In a pump for liquefied gases at low boiling point, a cylinder dipping in the liquefied gases and means for dissipating the heat developed in the cylinder by the movement of the piston in its cylinder.

2. In a pump for liquefied gases at low boiling point, a cylinder dipping in the liquefied gases, means for dissipating the heat developed in the cylinder by the movement of the piston in its cylinder and a discharge valve the seat of which is made of slightly plastic material.

3. In a pump for liquefied gases at low boiling point, a cylinder dipping in the liquefied gases, means for dissipating the heat developed in the cylinder by the movement of the piston in its cylinder and a discharge valve the seat thereof being made of copper.

4. In a pump for liquefied gases a cylinder dipping in the liquid, a tube surrounding the actuating rod of the pump and spaced from this rod, and means for preventing the lubricating oil at the sliding guide head to penetrate in the cylinder.

5. In a pump for liquefied gases, electrically driven by a motor and forcing the liquefied gases into a vaporizer heating means for electrically heating the vaporizer by the electric current which supplies the said motor and means for cutting automatically the said heating means out of the circuit on the stoppage of the pump.

6. In a pump for liquefied gases at low boiling point, a cylinder dipping in the liquefied gases, provided with suction and discharge valves, means for dissipating the heat developed in the cylinder by the movement of the piston in its cylinder and ports situated in the wall of the cylinder, the upper edges of them being substantially flush with the under face of the piston at the end of its suction stroke.

7. In a pump for liquefied gases at low boiling point, a cylinder dipping in the liquefied gases, provided only with discharge valve, means for dissipating the heat developed in the cylinder by the movement of the piston in its cylinder and ports situated in the wall of the cylinder, the upper edges of them being substantially flush with the under face of the piston at the end of its suction stroke.

8. In a pump for liquefied gases a cylinder dipping in the liquid, a tube sustaining the said cylinder and an actuating rod for the piston surrounded by the said tube and spaced therefrom.

In witness whereof I have hereunto set my hand.

CHARLES PICARD.