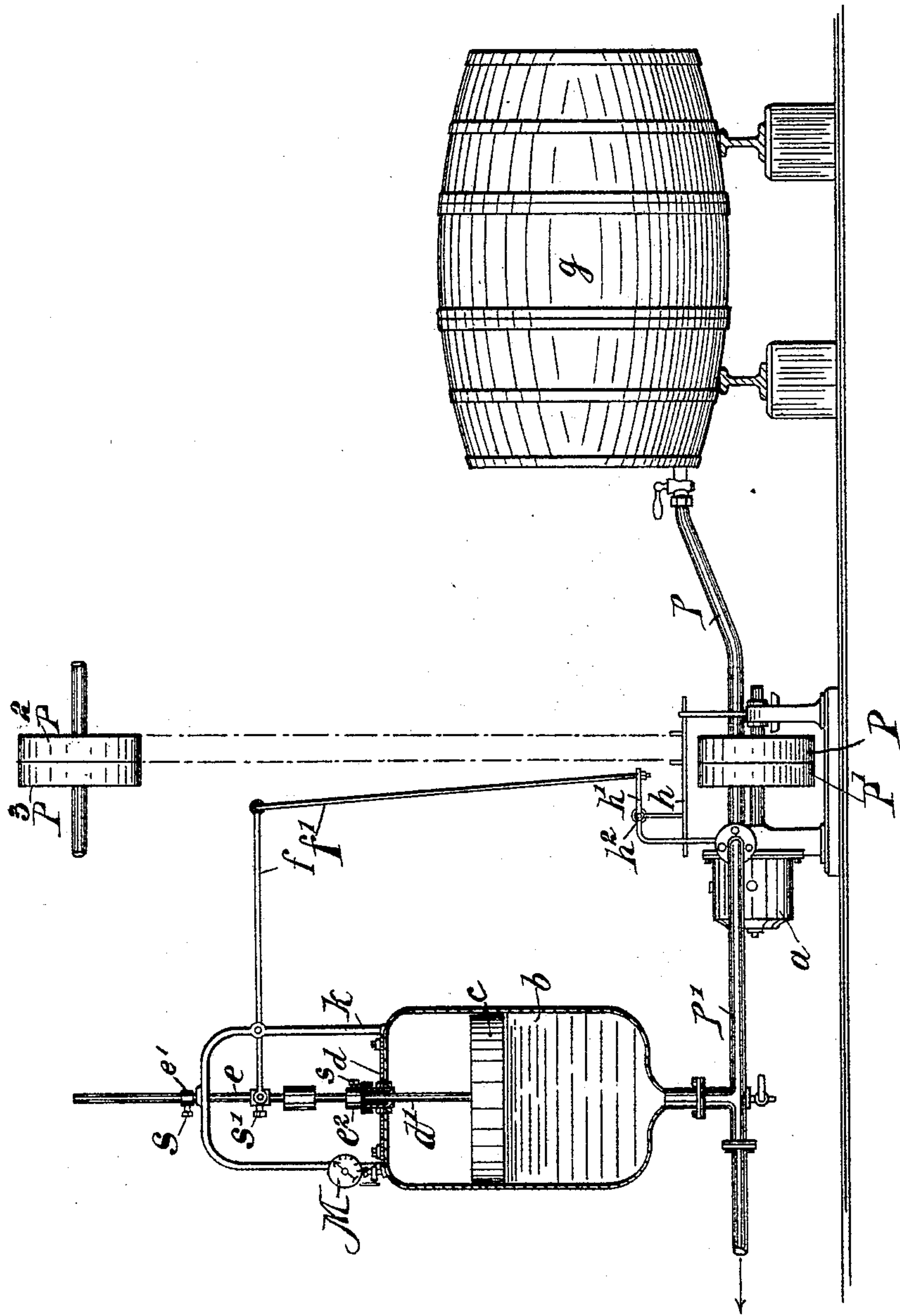


(No Model.)

J. G. W. HARTMANN.
PRESSURE REGULATOR.

No. 500,126.

Patented June 27, 1893.



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JOHANN GEORG WILHELM HARTMANN, OF OFFENBACH-ON-THE-MAIN,
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PRESSURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 500,126, dated June 27, 1893.

Application filed October 27, 1892. Serial No. 450,140. (No model.) Patented in Germany October 28, 1890, No. 56,676.

To all whom it may concern:

Be it known that I, JOHANN GEORG WILHELM HARTMANN, engineer, a subject of the Emperor of Germany, residing at Offenbach-on-the-Main, Germany, have invented certain new and useful Improvements in Pressure-Regulators for Use in the Filtration of Liquids, (for which I have obtained a German patent, No. 56,676, dated October 28, 1890;) 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention has relation to pressure regulators more especially adapted for use in the filtration of effervescent liquids, as beer, and particularly in drawing off beer from stationary or stand casks through a filter under pressure.

It has heretofore been the practice, in order to obtain a good flow of beer, to force the same from the cask through the filter by air or gas pressure, and this pressure is such as to give rise to serious losses, and is a source of danger to the workmen, as the head or heads of the cask are liable to give way under the pressure, or the cask is liable to burst or explode.

The invention has for its object the provision of means whereby these difficulties and dangers are absolutely avoided, and it consists essentially in the interposition between the pump and the filter, of a pressure regulator operating automatically under variable pressures to control the operation of the pump, so that the beer may be drawn off without pressure in the cask or under a comparatively low pressure, and forced through the filter at a substantially uniform pressure.

The invention further consists in the construction of the pressure regulator, and in means whereby said regulator may be adjusted to operate under given pressures, as will now be fully described, reference being had to the accompanying drawings which illustrate by a sectional elevation a pressure regulator combined with a suction and force pump, and their arrangement relatively to a cask,

and a pipe leading to a filter, which latter I have deemed unnecessary to show as it may be of any well known construction and is, as usual interposed between the pump and the receiving cask or vessel, and according to my invention between the said cask and the pressure regulator.

In the drawings, *g*, indicates the cask from which the beer is drawn, *p*, the pipe leading from the cask to the pump, *a*; and *p'*, the pipe leading from the pump to the pressure regulator and to the filter.

P, and *P'*, are the fast and loose belt pulleys on the driving shaft of the pump. *P²*, *P³*, are the fast and loose belt pulleys on the motor driven shaft.

The pressure regulator consists of an air chamber, *b*, connected with the force pipe, *p'*, the head of said chamber being formed by a more or less elastic diaphragm, *d*, that has a central stuffing box, *d'*, through which passes the rod, *e*, of a float piston, *c*, means being provided for connecting the rod with the diaphragm, *d*, and for adjusting the same, and therethrough the piston, relatively to said diaphragm. These means as shown, consist of two sleeves, *e'*, and *e²*, adapted to be secured to the piston rod, *e*, by means of set screws, *s*, the sleeve, *e'*, limiting the downward movement of the piston by seating on a guide bearing for the piston rod formed in a yoke, *k*, projecting from the air chamber, *b*, while the sleeve, *e²*, seats on the upper face of the stuffing box, *d'*, so that when said diaphragm is forced outwardly it will lift the piston, *c*. It will thus be seen that the piston is not only controlled by the variable pressure of the air in the chamber, *b*, but also by the pressure of the liquid entering the same from the force pipe, *p'*.

A lever, *f*, fulcrumed on the yoke, *k*, has a sleeve at one end through which the piston rod passes, said sleeve being secured to the rod by means of a set screw, *s'*, as shown, whereby the amplitude of the vibration of the lever may be regulated. This lever *f* is in practice connected with the throttle valve that controls the supply of steam to the pump, or the said valve may be connected with the lever through intermediate devices, as circumstances may require. The lever *f*

may also be employed to actuate belt shifting devices, as shown in the drawings.

The belt, B, shown in dotted lines may be shifted from the fast to the loose pulley and vice versa, and the said shifting fork may be controlled by the movements of the piston, or more properly, by those of the diaphragm, as follows: The opposite end of the lever, *f*, is pivotally connected at one end of a connecting rod, *f'*, whose other end is similarly connected to the horizontal arm of an angle lever, *h'*, fulcrumed at *h*² in a standard rising from the pump frame, the vertical arm of said angle lever serving to operate the shifting fork, *h*, to move the belt, B, from the fast pulley, P, to the loose pulley, P', and vice versa.

M, indicates a pressure indicator connected with the air chamber, *b*, of the pressure regulator for obvious purposes.

The operation of the pressure regulator is as follows: The float piston, *c*, having been adjusted within the air chamber relatively to the diaphragm, *d*, according to the pressure under which it is desired to force the beer through the filter, the pump is set in operation, drawing the beer from the cask, G, and forcing it to the filter as well as into the air chamber, the air therein being correspondingly compressed. So long as the pressure in the air chamber does not exceed the pressure under which it is desired to force the beer through the filter, the float piston will remain in the position to which it has been adjusted. As soon, however, as the pressure at the filter rises above the desired pressure, the column of beer in the air chamber will also rise and compress the air therein accordingly, the diaphragm, *d*, under the increased pressure of the air will be forced outwardly or upwardly, carrying along the float piston *c*, which movements are assisted and intensified by the rising column of beer. This upward movement of the piston and its rod causes the lever, *f*, to swing on its fulcrum, its outer end moving downwardly moving the connecting rod, *f'*, in the same direction and tilting the shifting fork actuating lever, *h*, so as to move the fork to the left, thereby carrying the belt from the fast pulley, P, to the loose pulley, P', and stopping the operation of the pump. As the pressure at the filter is reduced, a corresponding reduction of the pressure of the air in the air chamber, *b*, takes place by the sinking of the level of the beer flowing out of said chamber, allowing the diaphragm, *d*, and float piston, *c*, to return to their normal positions, whereby the belt, B, is shifted back to the fast pulley and the pump is again started.

The object of using a diaphragm in combination with the float is three fold, first, to render the pressure variation transmitting devices, namely the piston and diaphragm, more sensitive, since one is influenced solely by variations in the pressure of the air with-

in the chamber and the other is influenced solely by the variations in the position of the compressing medium, while the variations in both media are simultaneously transmitted to the pressure controlling devices. Secondly, the combination affords a better means for adjusting the devices to given pressures, and, lastly, all leakages at the stuffing box in which the piston or float rod would otherwise have to move, and the consequent irregularities in the operation of the regulator are avoided. Of course either the diaphragm or the piston may be employed alone and the same results obtained, but for reasons stated I prefer to combine the two.

I prefer to conduct the operation of drawing off under a slight pressure in the cask, not more than about 0.2 atmospheres to insure a more uniform flow of the beer to the pump and avoid the stirring up of the sedimentary matter in the cask which would otherwise take place under the suction action of said pump.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination with a pump and its force pipe, of a pressure regulator comprising an air chamber in communication with said force pipe, a diaphragm controlled by the pressure of the air in the chamber and controlling the operation of the pump, and a piston connected with said diaphragm and exposed to the pressure of the liquid entering the chamber from the force pipe, substantially as and for the purpose set forth.

2. The combination with a pump and its discharge or force pipe, of a pressure regulator comprising an air chamber in communication with the force pipe, a diaphragm exposed to the pressure of the air in the chamber, a piston in the latter adjustable relatively to and adapted to be moved by the diaphragm, said piston being exposed to the pressure of the liquid entering the chamber from the force pipe, and regulating devices controlled by the diaphragm and piston, and controlling the operation of the pump, for the purpose set forth.

3. The combination with a pump and its discharge or force pipe, of a pressure regulator in communication with the force pipe and having a flexible head, a piston contained in the chamber, the piston rod extending through and adjustable relatively to said head, said piston being controlled in its movements by the flexible head and the pressure of the liquid entering the chamber from the force pipe, and regulating devices controlled by the piston rod and controlling the operation of the pump, for the purpose set forth.

JOHANN GEORG WILHELM HARTMANN.

Witnesses:

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