

June 24, 1930.

A. MEYER

1,766,666

STEAM SEPARATOR

Filed June 7, 1926

Fig. 1.

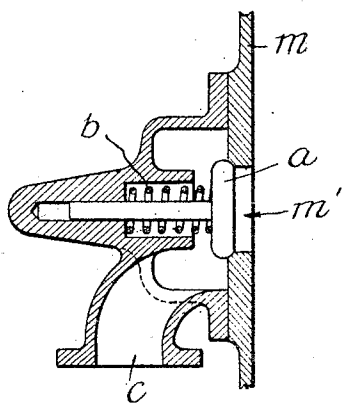


Fig. 2.

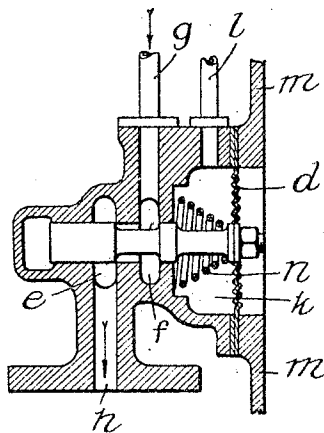
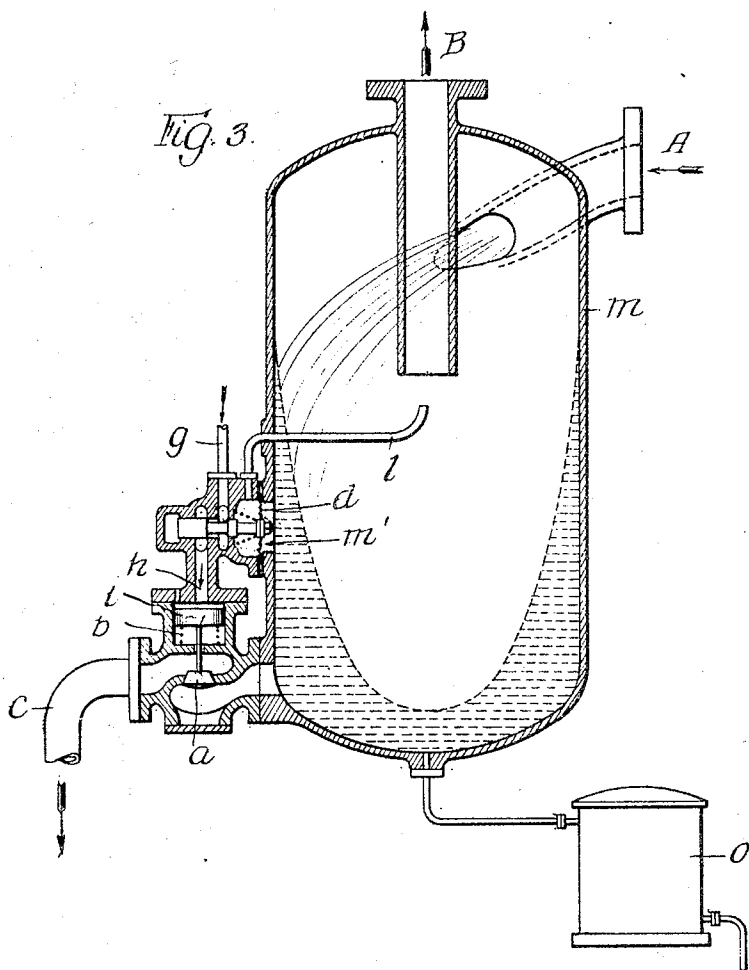


Fig. 3.



Inventor:

Adolf Meyer,
By Cromwell, Christensen
Atty.

UNITED STATES PATENT OFFICE

ADOLF MEYER, OF KUSNACHT, NEAR ZURICH, SWITZERLAND, ASSIGNOR TO AKTIEN-GESELLSCHAFT BROWN BOVERI & CIE., OF BADEN, SWITZERLAND, A JOINT-STOCK COMPANY OF SWITZERLAND

STEAM SEPARATOR

Application filed June 7, 1926, Serial No. 114,066, and in Germany July 22, 1925.

This invention relates to apparatus for separating fluids such as water or other liquid from steam or the like.

The general object is the provision of an effective separator which will be reliable to discharge the separated liquid from the separating chamber, and prevent its re-entering the system in which the separator is employed.

Another object is the provision of apparatus which is simple in construction and automatic in operation for accomplishment of the result indicated.

Other and further objects will be pointed out or indicated hereinafter, or obvious to one skilled in the art upon an understanding of the invention.

In the drawing forming a part of this specification I show two forms in which the invention may be embodied, but these are presented for illustration only and are not to be construed to impose limitations on the claims not necessitated by the prior art.

In the drawing,

Fig. 1 is a detail in the nature of a sectional elevation of a discharge control valve in connection with the tank of a steam separator.

Fig. 2 is a similar detail of a portion of the apparatus shown in Fig. 3, and

Fig. 3 is a sectional elevation of a separator and automatic discharge control apparatus.

The usual type of steam separator for steam power plant consists of a vessel through which the steam is passed and having the inlet and outlet disposed in such a way that the entering water is not carried away by the outgoing steam. The water which collects is led off to a trap which is periodically emptied by means of a float controlled valve or similar device. Such means cease to be effective in preventing water being carried over to the prime mover if considerable quantities have to be dealt with, such as may happen if priming of the boiler occurs. There is then a danger of water-hammer occurring in the engines. The present invention contemplates an arrangement wherein the pressure of the accumulated water causes the opening of a special outlet valve independent of the trap provided. The force required to bring about opening of this outlet valve may conveniently

be obtained by giving a circular motion to the water and making use of the resulting centrifugal action. The water can be set in motion by the well-known method of letting the steam enter the separator tangentially and giving the vessel the form of a solid of revolution. The steam inlet may in addition be arranged at an angle to the principal axis of the vessel so that the entering steam and water mixture describes a descending spiral path in the interior of the separator. The water consequently separates from the steam and is given a rotatory motion, with the result that the centrifugal forces exerted on the sides of the vessel are quite considerable. This force can be utilized directly to open the outlet valve or may act through a relay gear, the valve itself being opened by fluid pressure. The operating medium in this case may be steam, or water or oil under pressure.

The relay controlling the drain valve of the separator may be provided with a piston or diaphragm which is exposed on one side to the action of the combined steam and water pressures and on the other side to the pressure of the steam alone. This arrangement insures that the position of the piston or diaphragm will not be affected by variations in the steam pressure. The gear can of course be rendered more stable in action by the addition of a spring. For dealing with small quantities of water which are not sufficient to operate the valve, a steam trap of the usual type may be provided in addition.

The drawing illustrates several forms of the invention.

Fig. 1 represents an outlet valve designed for direct operation by the centrifugal action of the separated water. The valve *a* is subjected to the pressure of the body of water in the tank *m* through an opening *m'* in the side of the latter and is held in the closed position by a spring *b* which is powerful enough to resist the pressure of the steam alone. As soon as this is augmented by the additional pressure of the rotating mass of water, the valve opens and the water escapes through the outlet *c*. One limitation of this apparatus is that if the steam pressure should drop the combined steam and water pressures may

icated at 28. The extreme forward end of the shaft is reduced as at 29, and rotatably supports the rotor 30 provided with an internal bushing 31 journaled on the reduced extremity of the shaft. The pump is of the eccentric type and is provided with the usual spring pressed blades 32. The pump cylinder being rigidly fastened on the shaft 14, is held stationary therewith, and, as will be understood, the cylinder portion thereof is arranged eccentrically of the shaft, so as to insure proper pumping action of the rotor.

The rotor is extended externally of the cover plate 26, as indicated at 33, and is slotted at 34 so as to receive the key 35 stamped out of the shell cover 21, whereby rotary motion of the shell and its cover is imparted to the rotor.

The shaft 14 is provided with a passage 35' communicating at one end with the vacuum pipe 12, and at its opposite end with the pump inlet port 36; the outlet port 37 of the pump being in communication with the interior of the shell, the fluid ejected by the pump passing through said shell and outwardly to the atmosphere through the passage 18.

The shell 16 is adapted to contain a quantity of liquid lubricant which may be introduced therein through a suitable capped filling opening, or in any other preferred manner, and incident to the rotary motion of the fan and hub shell, the lubricant contained therein, is distributed uniformly about the circumference of the shell by centrifugal force. An inwardly flaring oil guard 38 is arranged at the passage 18, and the flange 39 thereof is turned over the edge of the shell 16, to fasten it in position. The lubricant in the shell circulates through apertures 40, provided in the flanges 17. The fixed side wall of the pump cylinder 25 is provided with deflecting vanes 41 which are so disposed as to scoop and deflect oil from about the wall of the shell 16, inwardly between the hub part 13, and the shaft 14, so as to maintain these parts in properly lubricated condition. The upper part of the fixed cylinder wall is provided with a port 42 into which the deflected oil passes, and flowing downwardly therein, enters the oil groove 43 in the shaft 14 by pressure. The front extremity of the groove 43 communicates with grooves 44 and 44', provided in the reduced end 39, so as to effectively lubricate the pump rotor 30.

In operation, the fan 7 which is constantly actuated during the operation of the explosive engine 5, through a power transmitting device 45, effects rotation of the rotor 30, through the key and slot connection 35 and 34, and the action of the pump blades 32 maintains a constant vacuum in the pipe 12 and tank 11. As stated, the effect of centrifugal force incident to rotation of the

shell 16, maintains the liquid lubricant evenly distributed over the entire inner face of the shell wall, and the scooping action of the outer portions of the vanes 41, causes an inward deflection of the lubricant between the hub and shaft, and that part of the lubricant which finds its way into the port 42 is distributed through the grooves 44 and 44' to effectively lubricate the pump rotor.

From the foregoing, it is believed that the construction, operation and advantages of the invention may be readily understood by those skilled in the art, and I am aware that changes may be made in the details disclosed without departing from the spirit of the invention as expressed in the claims.

What I claim and desire to secure by Letters Patent is:

1. In combination with a driven part of an explosive engine, including a hub part and a shell carried thereby, and a stationary shaft supporting the hub part, of a pump including a cylinder secured to said shaft, and a rotor, said shell including a removable cover, and means connecting the cover with the rotor for imparting movement thereto.

2. In combination with a driven part of an explosive engine, including a stationary shaft, a hub part journaled thereon, and a shell completely enclosing one end of the shaft and carried by the hub and having a closed front end, of a pump including a cylinder secured to the shaft, and a rotor, and means carried by the closed front end of the shell and coacting with the rotor to impart movement thereto.

3. In combination with a driven part of an explosive engine, including a stationary shaft, a hub part journaled thereon, and a shell carried by the hub part and provided with a removable front cover, of a pump carried by the shaft within the shell and including a rotor, and means on the shell cover engaging and imparting movement to the rotor.

4. In combination with a driven part of an explosive engine, including a stationary shaft, a hub part journaled thereon, and a shell carried by the hub part and provided with a removable front cover, of a pump carried by the shaft within the shell and including a rotor, and means on the shell cover engaging and imparting movement to the rotor, said shell cover being removable.

5. In combination with a driven part of an explosive engine, including a stationary shaft, a hub part journaled thereon, and a shell carried by the hub part and provided with a removable front cover, of a pump carried by the shaft within the shell and including a rotor, means on the shell cover engaging and imparting movement to the rotor, said shell cover being removable, and

sive element connected to said valve means for actuating the same, a source of fluid-pressure supply, valve means governing communication between said element and said source, and an actuating member for said last-mentioned valve means, said member being responsive to pressure conditions incident to the whirling movement of the separated liquid and operating independently of the vapor pressure in said chamber.

12. In apparatus for separating a mixture of vapor and liquid into its respective constituents, a chamber provided with an inlet for such mixture and outlets for the separated vapor and liquid, the mixture inlet being so disposed as to effect whirling movement of the separated liquid in said chamber by the action of the inflowing mixture, and means operable to control discharge of the separated liquid from said chamber by way of the outlet therefor, said means being responsive only to predetermined pressure conditions incident to the whirling movement of the separated liquid and being operable upon occurrence of such pressure conditions to provide for such discharge.

13. In apparatus for separating a mixture of vapor and liquid into its respective constituents, a chamber provided with an inlet for said mixture and outlets for the separated vapor and liquid, valve means for controlling the liquid outlet, fluid-pressure means for governing said valve means, and means including a part of said fluid-pressure means responsive to predetermined pressure conditions in said chamber, said pressure-responsive means being operable upon occurrence of said conditions to initiate valve governing action of said fluid-pressure means.

In testimony whereof I have hereunto subscribed my name at Camden, N. J., on the 3rd day of June, A. D. 1926.

ADOLF MEYER.