

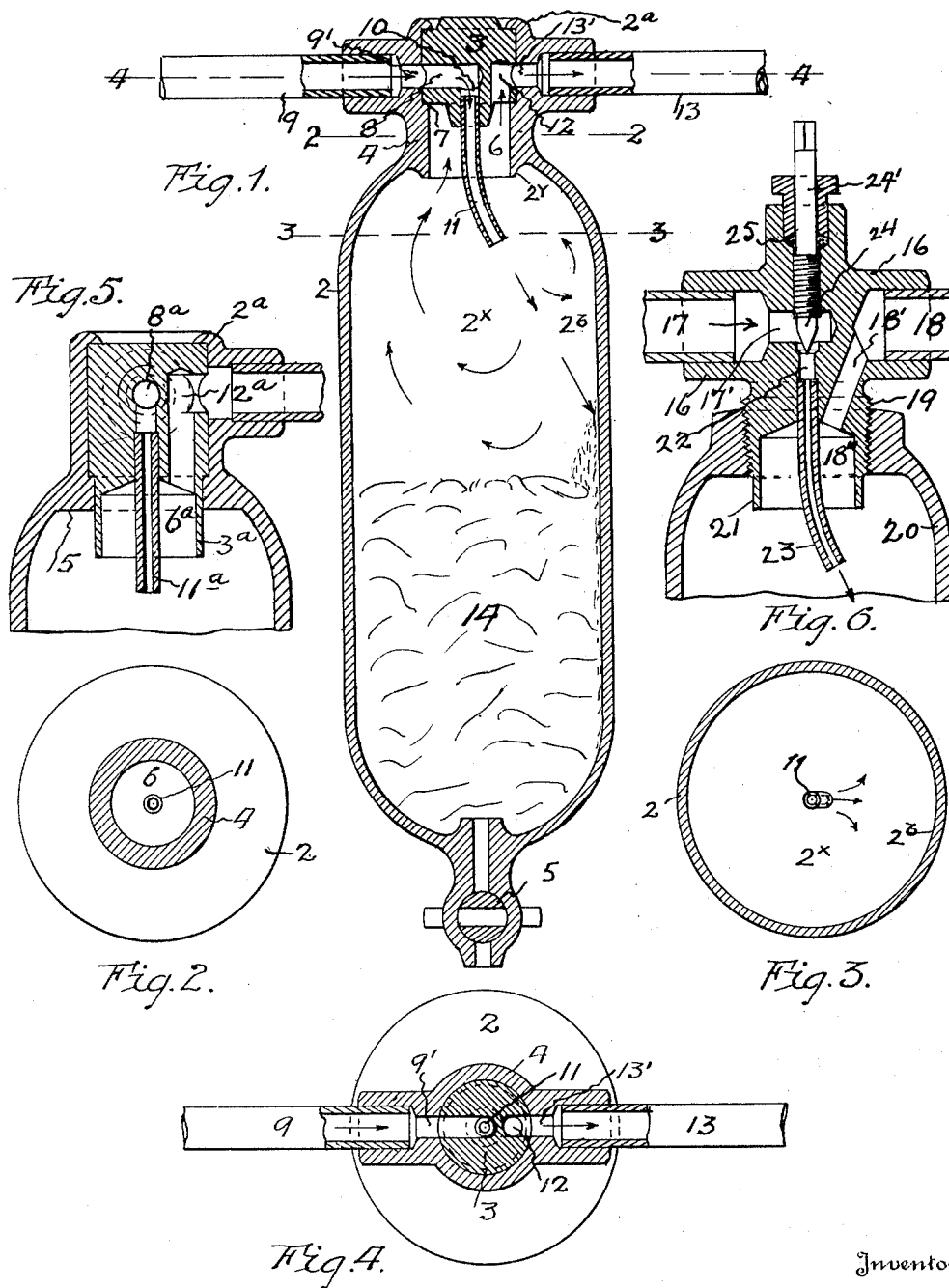
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C. G. HAWLEY

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IMPACT SEPARATOR

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Inventor

Charles G. Hawley.

By
23-27

B. A. Mason Attorney

UNITED STATES PATENT OFFICE

CHARLES GILBERT HAWLEY, OF CHICAGO, ILLINOIS, ASSIGNOR TO CENTRIFIX CORPORATION, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

IMPACT SEPARATOR

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This invention relates to improvements in the means employed for removing water and oil from compressed air which is to be used in paint sprayers and like small users of compressed air.

Such air users are characterized by extremely small air emission nozzles but are commonly supplied with compressed air through the medium of pipes of common and convenient sizes having cross-sectional areas which so greatly exceed the area of the ultimate nozzle or emission opening that the movement of the air through the pipe is too slow to admit of the effective employment of any ordinary separator in advance of the sprayer or other small user of air. Water and oil may in some measure be trapped in such separators but by wall creepage and otherwise too much moisture is permitted to reach the atomizing nozzle.

The object of this invention is to provide a separator that shall be peculiarly efficient and adapted for use in advance of such small users of air, and whereby the difficulties commonly encountered shall be obviated.

Primarily the invention comprises a separator adapted for attachment or inclusion in a pipe line of common size but having an admission passage of its own which is little larger than the emission orifice of the paint sprayer, or like, with which it is to be used. Instead of being an enlargement of the pipe line as is common in separators, the separator of this invention is distinguished by a downwardly extending admission nozzle, the cross section of which is only a few times larger than the cross section of the ultimate emission nozzle to be served. The separator includes a capacious collecting chamber below said nozzle. The outlet of the separator is in the top of said chamber and above the delivery end of the nozzle. By means of this arrangement the air, in advance of the point of use, is caused to enter a collecting chamber at very high velocity and is immediately permitted to expand enormously in said chamber, so that the air almost instantly loses its velocity and hence its capacity to convey moisture in suspension. Meantime the contained water and oil globules are forcibly

thrown against the walls of the chamber or against suitable material which loosely fills the chamber, and the liquids adhere thereto; leaving only clean dry air for departure from the top of the chamber. The invention also preferably includes a creepage preventing flange positioned in the upper part of the chamber, and which contains an opening so large that it does not interfere with the free and slow movement of the clean air toward the outlet, and yet said rib is sufficiently extensive and so advantageously disposed as to defeat the upward creepage of moisture to any extent that would permit it to leave the outlet of the separator.

Separators embodying this invention are extremely simple in construction; are of low cost, light weight and very efficient. The general characteristics of the invention and its specially novel features will best be understood by reference to the drawings that form part of this specification; in which:— Fig. 1 is a vertical section of a typical compressed air cleaner embodying the invention; Fig. 2 is a horizontal section on the line 2—2 of Fig. 1; Fig. 3 is a horizontal section on the line 3—3 of Fig. 1; Fig. 4 is a horizontal section on the line 4—4 of Fig. 1; Fig. 5 illustrates a combined nozzle plug and anti-creepage flange; and, Fig. 6 illustrates a separator head equipped with its own stop valve and adapted for insertion at the top of any suitable collecting chamber.

As here shown, the separator or compressed air cleaner of preferred form comprises only three parts; first, a chambered body 2 adapted to sustain the high pressures involved; second, an admission nozzle member 3, which is sealed within a ported neck 4 that is integral with the body 2; and, third, a drain valve, marked 5, which is the only movable member of the device. The neck 4 contains a central bore 6 that is enlarged in its upper part to provide the annular shoulder 7. The upper part of the bore contains the plug 3 which is driven into the same to make a tight joint with the neck 4 and is seated on the shoulder 7. Before the plug is inserted it is provided with the inlet passage 8 which communicates with the com-

pressed air supply pipe 9. It is also provided with a central bore 10 which receives the upper end of the restricted nozzle 11, above mentioned. In addition the plug contains the passage 12 which opens upward through the bottom thereof and is in communication with the off-take pipe 13. After the plug is inserted with its bores or ports in register with respective ports 9' and 13' in the neck, the plug is finally sealed and held against internal pressure by the turning over of the upper edge of the neck. The latter is made of malleable metal and the edge may be easily spun, rolled or peaned to form the plug locking bead 2^a. Preferably the nozzle 11 is bent or curved or otherwise positioned, as shown in Figs. 1 and 6. Thereby the high velocity jet which issues downward from the nozzle 11 is angularly projected against the inner wall 2^b of the chamber 2^x within the body 2. As explained, the cross-sectional area of the nozzle 11 is very small in comparison with the cross-sectional area of the supply pipe 9 but nevertheless the area of the nozzle is or should be considerably larger than the ultimate emission orifice at the end of the line 13. A proportion of four to one is practical, and while insuring the momentary high velocity of entrance to the chamber 2^x is large enough to prevent the closing of the nozzle 11 by accumulations of oil and dirt. While discussing this point it should be obvious that when this separator is placed in a line which contains internal scale the separator should be preceded by a screen or pocket that will serve to exclude the large flakes of scale from this relatively minute velocity-promoting nozzle.

It will be obvious that any liquids contained by the compressed air will be projected forcibly and angularly against the inner wall of the chamber 2^x; the liquids adhere to the wall naturally and as naturally drain to the bottom of the chamber. Liquid accumulations may be discharged under pressure through the valve 5.

The entrance of the high velocity compressed air is immediately followed by its loss of velocity due to the free expansion afforded within the relatively enormous chamber 2^x, and the air moves toward the outlet 12 so slowly and through so large an approach chamber (6) that it lacks any ability to raise moisture particles to the outlet. Should moisture creep upward upon the inner walls of the chamber 2^x it would be stopped by the anti-creepage rib before mentioned and marked 2^v in Fig. 1.

If desired the lower part of the chamber 2^x may be filled with a porous mass 14 of any suitable sort capable of retaining the moisture. However the chief duty of such filling is to prevent the splashing of the liquid accumulation by the velocity jet issuing from

the nozzle 11. The material 14 obviously is placed in the pocket chamber through the large bore 6, before the plug is installed.

Finally, it should be noted that the bent nozzle 11 has a total radius that is less than the radius of the bore 6 so that the nozzle does not interfere with the pressing home of the nozzle plug 3.

The structure of Fig. 5 corresponds to that of Fig. 1 in the main, but differs therefrom in presenting an inlet passage 8^a which is at right angles to the outlet 12^a. A difference will also be observed in the velocity nozzle 11^a which is straight, by way of contrast, with the bent nozzles at Figs. 1 and 6. The operation of the same is the same in principle. Obviously the nozzle 11^a of Fig. 5 may also be bent or positioned angularly in the plug in order to insure the angular impact of the foreign substances upon the side wall of the chamber or pocket. A further difference comprises the skirt 3^a which is formed on the plug surrounding the outlet cavity 6^a. This skirt or flange 3^a extends below the top 15 of the separator pocket and serves as the anti-creepage rib before mentioned.

It is frequently convenient to make the separating head and the collection pocket after the manner illustrated in Fig. 6; the shape of the pocket, its diameter, etc., being relatively unimportant; while the construction of the head must be carefully planned. The essential part of the device comprises the T-shaped head 16. The cross arm portion is fitted to receive the incoming and outgoing pipe connections 17 and 18 and contains respective inlet and outlet ports 17' and 18'. The lower part of the head is provided with a pipe thread 19 so that it may be screwed into the top of any suitable and convenient collecting pocket 20. The lower end contains the outlet chamber 18'' and preferably is marked by the anti-creepage rib or extension 21. The central bore 22 at the lower end receives the velocity nozzle 23 and at the upper end is formed to coact with the shut off and regulating valve 24. The stem 24' passes through a suitable stuffing box 25 and is squared at the upper end so that the valve may be conveniently manipulated. This form of the device is specially recommended for use at the hose connection of the paint sprayer or other user. For it will prove both convenient and practical to use the device 24 as the line valve. Further it is best to close the line at this point when the sprayer is out of use, for upon the next opening of the valve all water behind the valve will immediately be discharged into the connecting pocket and thus be promptly disposed of.

Doubtless these separators will prove to be of value in pressure lines other than air lines, but their primary value lies in their

use in advance of users of small quantities of compressed air.

Having thus described my invention I claim as new and desire to secure by Letters

Patent:—

1. A moisture separator adapted for installation in a compressed fluid line supplying a relatively small quantity thereof and comprising a relatively capacious collecting pocket having inlet and outlet ports at its top, in combination with a relatively restricted and elongated velocity promoting admission nozzle leading and discharging downward from said inlet port and within the upper part of said pocket laterally against the wall of said pocket.

2. A moisture separator adapted for installation in a compressed fluid line supplying a relatively small quantity thereof and comprising a relatively capacious collecting pocket having inlet and outlet ports at its top, in combination with a relatively restricted and elongated velocity promoting admission nozzle leading and discharging downward from said inlet port and within the upper part of said pocket and the inner surface of said pocket presenting an anti-creepage rib in advance of said outlet port.

3. A moisture separator adapted for installation in a compressed fluid line supplying a relatively small quantity thereof and comprising a relatively capacious collecting pocket having inlet and outlet ports in its top, in combination with a relatively restricted and elongated admission nozzle curving downwardly from said inlet port and within the upper part of said pocket, formed and positioned to direct the foreign substances entrained by the compressed fluid obtusely against a vertical wall of said pocket.

4. The herein described separator head having a lower end formed for attachment to a collecting pocket of larger diameter, said head having transversely disposed inlet and outlet ports, a bore at right angles to and communicating with said inlet port, an elongated velocity promoting nozzle of relatively restricted capacity leading downwardly from said bore to a point below said head, the latter also having an outlet duct leading upward through the lower end thereof and into communication with said outlet port.

5. The herein described separator head having a lower end formed for attachment to a collecting pocket of larger diameter, said head having transversely disposed inlet and outlet ports and a vertical bore at right angles to and communicating with said inlet port, a curved velocity promoting nozzle of relatively restricted capacity leading from said vertical bore to a point beyond the end of said head, and said head also containing an outlet duct which leads upward through the lower end thereof and into communication with said outlet port.

6. The herein described separator head having a lower end adapted for attachment to a collecting pocket of larger diameter, said head having transversely disposed inlet and outlet ports and a vertical bore communicating with said inlet port, a velocity promoting nozzle leading downward from said vertical bore and of much restricted capacity in comparison with said inlet and outlet ports, said head also containing an outlet duct which leads upward through the lower end thereof and into communication with said outlet port, and said head also having at its lower end an anti-creepage flange the interior of which defines a relatively large outlet cavity which communicates with the lower end of said duct.

7. The herein described separator head having a lower end adapted for attachment to a collecting pocket of larger diameter, said head having transversely disposed inlet and outlet ports and a vertical bore communicating with said inlet port, a velocity promoting nozzle leading downward from said vertical bore and of much restricted capacity in comparison with said inlet and outlet ports, said head also containing an outlet duct which leads upward through the lower end thereof and into communication with said outlet port, and the upper part of said head containing a stop valve.

In testimony whereof, I have hereunto set my hand this 8th day of December, A. D. 1927.

CHARLES GILBERT HAWLEY.