March 31, 1936. J. A. STUARD 2,036,106

SEPARATOR

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Fig. 1

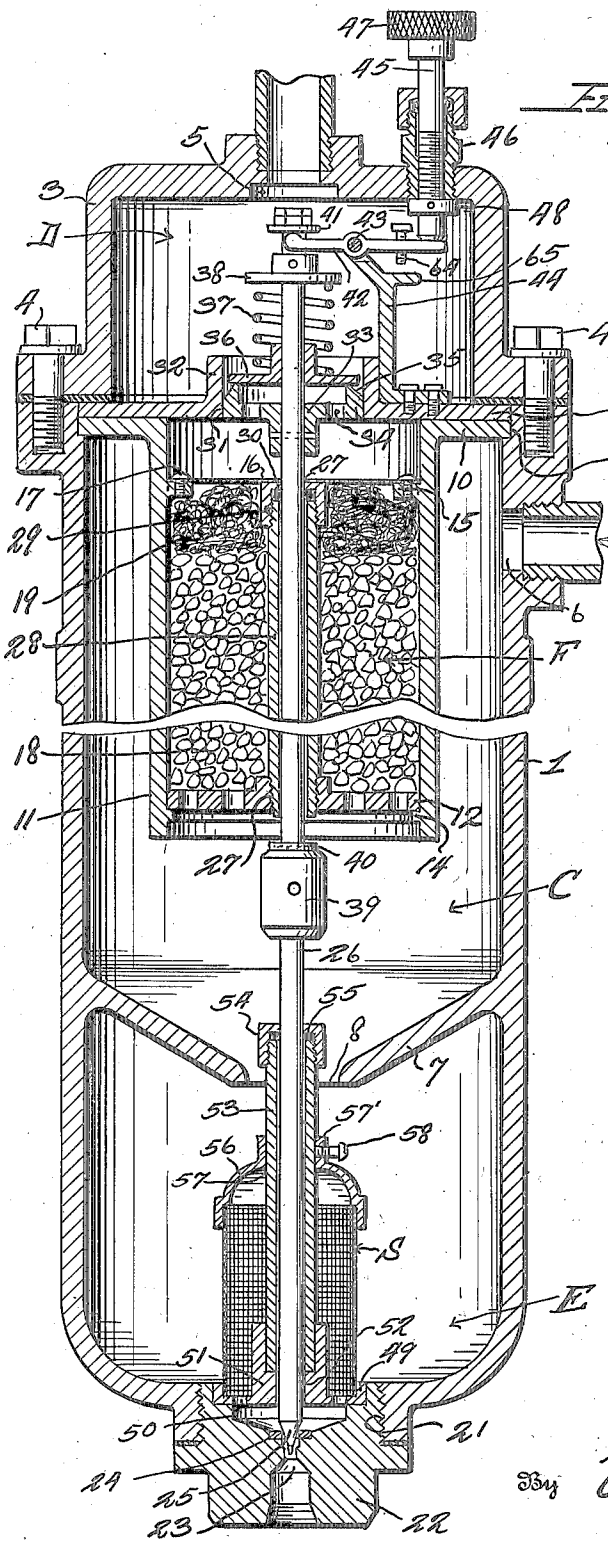


Fig. 3

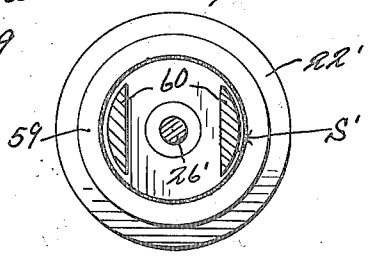
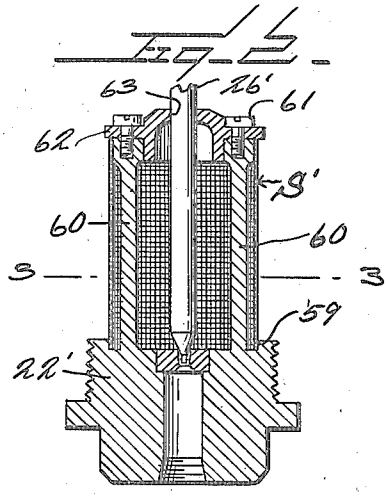


Fig. 4



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10 Claims. (Cl. 137—103)

This invention relates to a separator, and it is an object of the present invention to provide a device of this kind with novel and improved means controlled by the air in transit for maintaining in open position the valve for a vent opening of a casing comprised in the structure of the separator.

It is also an object of the invention to provide an apparatus of this kind for removing moisture from a flowing stream of compressed air comprising a casing through which the air travels, said casing having a vent opening under control of a valve and wherein means are provided for maintaining the valve in open position when the air stream is flowing and also wherein is provided a screening element associated with the vent opening.

The invention consists in the details of construction and in the combination and arrangement of the several parts of my improved separator whereby certain important advantages are attained and the device rendered simpler, less expensive and otherwise more convenient and advantageous for use, as will be hereinafter more fully set forth.

The novel features of my invention will hereinafter be definitely claimed.

In order that my invention may be the better understood, I will now proceed to describe the same with reference to the accompanying drawing, wherein:—

Figure 1 is a view partly in section and partly in elevation illustrating a separator constructed in accordance with an embodiment of my invention;

Figure 2 is a fragmentary view partly in section and partly in elevation illustrating a screening element constructed in accordance with another embodiment of my invention;

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 2.

As disclosed in the accompanying drawing, the separator comprises a casing or shell 1 of desired configuration and dimensions and having one end closed by an integral head 2 while the opposite end is initially open but adapted to be closed by a cap 3 removably held to the open end portion of the shell or casing 1 by the bolts 4. The cap 3 in its central part is provided with an outlet port 5 while the side wall of the casing or shell 1 in relatively close proximity to its initially open end is provided with an inlet port 6.

The lower portion of the shell or casing 1 has disposed thereacross a partition 7 dividing the casing or shell 1 into an upper separating chamber C and a lower elimination chamber E.

These two chambers are in communication through the opening 8 at the bottom portion of the partition 7 which, as illustrated in Figure 1 of the drawing, is in the form of an inverted truncated cone.

The casing or shell 1 closely adjacent to its upper or initially open end is provided thereabout with an internal shoulder 9 upon which is rested the outer marginal portion of a flange 10 extending outwardly from the upper end portion of a tubular member 11. The interior of this member 11 constitutes a filtering chamber F and the lower end of the member 11 is intersected by a perforated plate 12 resting from above upon an annular shoulder or flange 14 within the lower portion of the member 11. The upper portion of the member 11 is also provided with an internal flange 15 upon which engages the marginal portion of a perforated plate 16, said plate being held in position by the threaded members 17 or the like directed through the plate 16 and threading into the flange 15.

The major portion of the chamber F is preferably filled with pebbles 18 and interposed between the pebbles 18 and the applied plate 16 is a packing or lamination 19 of ginned wool or other shredded fibrous material.

Overlying the flange 10 of the member 11 and in direct contact therewith is the marginal portion of a plate 20, the outer face of which being substantially flush with the adjacent end of the casing or shell 1 and which plate closes the inner face of the cap 3 whereby the interior of the cap 3 constitutes a dry air chamber D with which directly communicates the outlet port 5 hereinbefore referred to.

The head or end 2 of the casing or shell 1 in its central portion is provided with an opening 21 in which is threaded or otherwise engaged a plug 22. This plug 22 has directed therethrough a drain opening 23 provided intermediate its ends with an internal valve seat 24 with which coacts a needle valve 25 provided at an end portion of an elongated valve rod 26. This rod 26 is of a length to extend up through the chambers C and F into the chamber D, the plates 12 and 16 within the member 11 being provided with suitable openings 27 to permit of such passage of the rod and without interfering with endwise movement thereof. The portion of the rod passing through the member 11 is substantially housed by a sleeve 28, the lower end portion of which being threaded or otherwise engaged within the opening 27 in

the lower plate 12 while the opposite or upper end portion of the sleeve 28 is closed by a cap 29. Within this cap 29 for coaction with the rod 26 is suitable packing 30.

The central portion of the plate 20 is provided with a relatively large opening 31 through which the rod 26 also passes and said opening 31 is defined by a surrounding sleeve 32. Keyed or otherwise secured to the rod 26 and normally positioned within the opening 31 or the lower portion of the sleeve 32 is a piston 33. This piston 33 intersects the bore of the sleeve 32 and is provided with relatively large perforations 34. The marginal portion of the piston 33 is defined by an upstanding feather-edge flange 35 upon which seats an imperforate plate or disk 36. This plate or disk 36 is slidably mounted upon the rod 26 above the piston 33 and said disk or plate 36 is normally maintained in contact with or seated upon the flange 35 by an expansible member 37. This member 37, as herein disclosed, comprises a coil spring surrounding the rod 26 within the dry air chamber D and interposed between the plate or disk 36 and a head or enlargement 38 keyed or otherwise fixed to the rod 26.

The rod 26 below the plate 12 of the member 11 has secured thereto a weighted member 39 to facilitate the downward or closing movement of the needle valve 23 and the upper end of this member 39 is faced with a washer 40 of suitable material which, upon upward or outward movement of the rod 26, comes into contact with the lower or adjacent end of the sleeve 28 whereby the bore of the sleeve is effectively closed against flow of moisture laden air up through the sleeve 28 and around the portion of the rod 26 therein. This flow of moisture laden air is also stopped by the packing 30 hereinbefore referred to.

Outwardly of the enlargement or head 38 the rod 26 is provided with a second head or enlargement 41 with which engages from below an end portion of a rock lever 42. This lever 42 is pivotally connected intermediate its ends, as at 43, with an upstanding post or bracket 44 mounted upon the plate 20. The opposite or outer end portion of the lever 42 is engaged from above by a shank 45. This shank 45 is threaded through a bushing 46 extended through the wall of the cap 3 and the outer end portion of the shank carries a head 47 whereby the shank 45 may be readily operated to swing the lever 42 in a direction to effect a manual lifting of the rod 26 and for maintaining the needle valve 25 in its lifted or opened position. The shank 45 within the chamber D carries a surrounding stop collar 48 which, as herein disclosed, contacts with the inserted end of the bushing 46 to limit the extent of outward movement of the shank 45. When at its outward limit of movement which may also be termed its normal position, the shank 45 through the lever 42 offers no hinderance or obstruction to the desired automatic endwise movement of the rod 26 as will hereinafter be more fully explained.

Fitting within the upper portion of the plug 22 and extending across the adjacent enlarged end portion of the vent opening 23 through said plug is a plate 49 having openings 50 in direct communication with the adjacent end of the vent opening 23. The central portion of the plate 49 is provided with an upstanding block 51 having a central opening 52 through which the lower end portion of the rod 26 is directed, said block 51 constituting a guide for said lower end portion of the rod. The upper or outer portion of the opening 52 of the block 51 is enlarged to permit the insertion therein of the lower end portion of a sleeve 53 through which the rod 26 is freely disposed. This sleeve 53 is of a length to extend from the applied plug 22 through the elimination chamber E to slightly within the separating chamber C through the opening 8 in the partition 7. The outer or upper end of this sleeve 53 is closed by a cap 54, said cap also serving to hold in closed contact with the rod 26 a suitable packing medium 55.

The plate 49 provides a seat for a cylindrical screening unit or element S on the top of which is fitted a cap 56. The central portion of the cap 56 has an opening 57 defined by an outstanding collar 57' whereby the cap 56 may be readily placed upon the sleeve 53 and in proper engagement with the screening unit or element S. Threaded through the collar 57' is a holding or binding screw 58 which coacts with the sleeve 53 to hold the cap 56 in place.

In the embodiment of the invention as illustrated in Figure 2, the cylindrical screening unit or element S' is rested directly from above upon the plug 22', the top surface or face of the plug 22' being provided with an internal annular shoulder 59 with which the lower end portion of the unit or element S' engages and thereby assuring its proper placement. At diametrically opposed points and inwardly of the shoulder 59, the plug 22' is provided with a pair of upstanding posts 60. These posts are substantially the same length as the unit or element S' and bolted, as at 61, or otherwise detachably secured to the outer ends of these posts 60 is a retaining plate 62.

As is particularly illustrated in Figure 2, the peripheral margin of the plate 62 overlies the outer end of the unit or element S'. This plate 62 is also provided with a central opening 63 through which the valve rod 26' passes.

As the air stream is flowing through the casing or shell 1 said stream will pass up through the chamber F whereby any foreign particles therein will be readily filtered out by the pebbles 18 and the lamination 19. The pressure of the air from below upon the piston 33 and the disk or plate 36 seated upon the piston will move the rod 26 upwardly until the gasket 40 comes into contact with the lower end of the sleeve 28 which, as illustrated in Figure 1, extends a slight distance below the plate 12. This contact of the washer 40 with the adjacent lower end of the sleeve 28 will effectively close the sleeve 28 against flow upwardly therethrough of moisture laden air and will at the same time prevent further upward movement of the rod 26 under the action of the air pressure. Upon the stopping of the upward or lifting movement of the rod 26 the continued pressure of the air from below upon the disk or plate 36 will overcome the resistance offered by the expansible member or spring 37 and lift the disk or plate 36 from the piston 33 so that the air may have free flow through the chamber C into the chamber D, and out through the port 5.

It is to be understood that when the air stream is flowing through the casing or shell 1 there is unhindered flow through the outlet port 5, thus assuring reduction of pressure in the chamber D and as the air pressure is greater than the resistance offered by the member or spring 37 the desired maintenance of the rod 26 in raised or lifted position is assured as is also the retaining of the disk or plate 36 in off or open position with respect to the piston 33. When the flow of the

air stream is closed out through the port 5 the pressures in the chambers C and D will substantially instantaneously equalize whereupon the member or spring 37 will return the disk or plate 36 to its seat upon the piston 33 and the rod 26 will drop to bring the needle valve 25 into closed position.

If it should be desired for any reason to maintain the needle valve 25 in open position and against automatic return, this can be accomplished by proper operation of the shank 45. The extent of lifting movement of the rod 26 by the shank 45 is controlled by contact of the member 64 carried by the lever 42 with the ledge 65 comprised in the post or bracket 44. This member 64, as herein disclosed, constitutes a bolt threading through the lever 42 at the side of its pivotal mounting 43 remote from the rod 26. By the use of the threaded bolt 64 the extent of raising movement of the rod 26 by the shank 45 can be regulated to a certain degree.

The member 39 serves as a shield or stop to prevent any moisture, which may have a tendency to collect on the lower portion of the rod 26 and pass upwardly thereof into the dry air chamber D. The packing 55 also provides a further means for this same purpose.

From the foregoing description it is thought to be obvious that a separator constructed in accordance with my invention is particularly well adapted for use by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that my invention is susceptible of some change and modification without departing from the principles and spirit thereof and for this reason I do not wish to be understood as limiting myself to the precise arrangement and formation of the several parts herein shown in carrying out my invention in practice except as hereinafter claimed.

I claim:—

1. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing divided into two chambers in communication one with the other, said casing having an inlet in communication with one chamber and an outlet in communication with the second chamber, the casing also having a vent opening in communication with the first chamber, a valve member normally closing the vent opening, a perforated member carried by the valve member intersecting the communication between the chambers, an imperforated member slidably carried by the valve member and normally closing flow through the perforated member, the air stream flowing through the casing coacting with said two last named members to move the valve member into open position and to open the communication between the chambers.

2. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having a separating chamber, said casing having an inlet and an outlet in communication with said separating chamber and also having a vent opening in communication with the separating chamber, a valve member normally closing the vent opening, and means carried by the valve member for closing the outlet when the valve member is in closed position, said means comprising two members one fixed to the valve member and the other having sliding movement therealong, one of said members being perforated and the other imperforated and normally closing flow through the perforated member, the air stream flowing through the casing coacting with said last named means to move the valve member into open position and to open the outlet.

3. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing providing a separating chamber, said casing having an inlet and an outlet in communication with the separating chamber and also having a vent opening in communication with the separating chamber, the outlet for the chamber including a sleeve, an elongated valve member normally closing the vent opening, said valve member extending through the sleeve, a piston fixed to the valve member and working in the sleeve, said piston having an outstanding continuous flange, said piston being perforated, a disk slidably mounted on the valve member, and means for constantly urging the disk into contact with the flange of the piston to close the flow through the sleeve when the valve member is in closed position, the air stream flowing through the casing coacting with said piston and disk to move the valve member into open position and then moving the disk free of the piston to assure flow of the stream through the outlet.

4. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing providing a separating chamber, said casing having an inlet and an outlet in communication with the separating chamber and also having a vent opening in communication with the separating chamber, the outlet for the chamber including a sleeve, an elongated valve member normally closing the vent opening, said valve member extending through the sleeve, a piston fixed to the valve member and working in the sleeve, said piston having an outstanding continuous flange, said piston being perforated, a disk slidably mounted on the valve member, means for constantly urging the disk into contact with the flange of the piston to close the flow through the sleeve when the valve member is in closed position, the air stream flowing through the casing coacting with said piston and disk to move the valve member into open position and then moving the disk free of the piston to assure flow of the stream through the outlet, and a weighted member carried by the valve member to facilitate its return to closed position.

5. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing providing a separating chamber, said casing having an inlet and an outlet in communication with the separating chamber and also having a vent opening in communication with the separating chamber, the outlet for the chamber including a sleeve, an elongated valve member normally closing the vent opening, said valve member extending through the sleeve, a piston fixed to the valve member and working in the sleeve, said piston having an outstanding continuous flange, said piston being perforated, a disk slidably mounted on the valve member, means for constantly urging the disk into contact with the flange of the piston to close the flow through the sleeve when the valve membr is in closed position, the air stream flowing through the casing coacting with said piston and disk to move the valve member into open position and then moving the disk free of the piston to assure flow of the stream through the outlet, and a weighted member carried by the valve member to facilitate its return to closed position, said weighted member providing a stop for moisture travelling along the valve member.

6. An apparatus for removing moisture from a

flowing stream of compressed air comprising a casing providing a separating chamber, said casing having an inlet and an outlet in communication with the separating chamber and also having a vent opening in communication with the separating chamber, the outlet for the chamber including a sleeve, an elongated valve member normally closing the vent opening, said valve member extending through the sleeve, a piston fixed to the valve member and working in the sleeve, said piston having an outstanding continuous flange, said piston being perforated, a disk slidably mounted on the valve member, means for constantly urging the disk into contact with the flange of the piston to close the flow through the sleeve when the valve member is in closed position, the air stream flowing through the casing coacting with said piston and disk to move the valve member into open position and then moving the disk free of the piston to assure flow of the stream through the outlet, and means for limiting the extent of movement of the valve member away from its seat.

7. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having a separating chamber, said casing having an inlet and an outlet in communication with said separating chamber and also a vent opening in communication with the separating chamber, a valve member normally closing the vent opening, a perforated member and an imperforated member carried by the valve member, one of said members being fixed to the valve member and the other having movement lengthwise thereof, said perforated member and imperforated member intersecting the outlet, the air stream flowing through the casing first moving both the perforated and imperforated members to move the valve member into open position and then moving the imperforated member to permit the air stream flowing through the outlet.

8. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an exit for the air stream and also having a vent opening, a filtering chamber within the casing with which the exit communicates, a valve member for the vent opening, said member having a part extending within the filtering chamber, a sleeve within the filtering chamber through which the valve member is directed, means carried by the valve member for contact with an end of the sleeve to close said sleeve and also to limit the movement of the valve member in a direction away from its seat, and means controlled by the flow of the air stream for maintaining the valve member in open position while the air stream is flowing.

9. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an exit for the air stream and also having a vent opening, a filtering chamber within the casing with which the exit communicates, a valve member for the vent opening, said member having a part extending within the filtering chamber, means operated by the air stream when flowing to maintain open the vent opening, and a weighted member carried by the valve member to facilitate its return to closed position.

10. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an exit for the air stream and also having a vent opening, a filtering chamber within the casing with which the exit communicates, a valve member for the vent opening, said member having a part extending within the filtering chamber, means operated by the air stream when flowing to maintain open the vent opening, and a member carried by the valve member to provide a stop for moisture travelling along the valve member.

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