

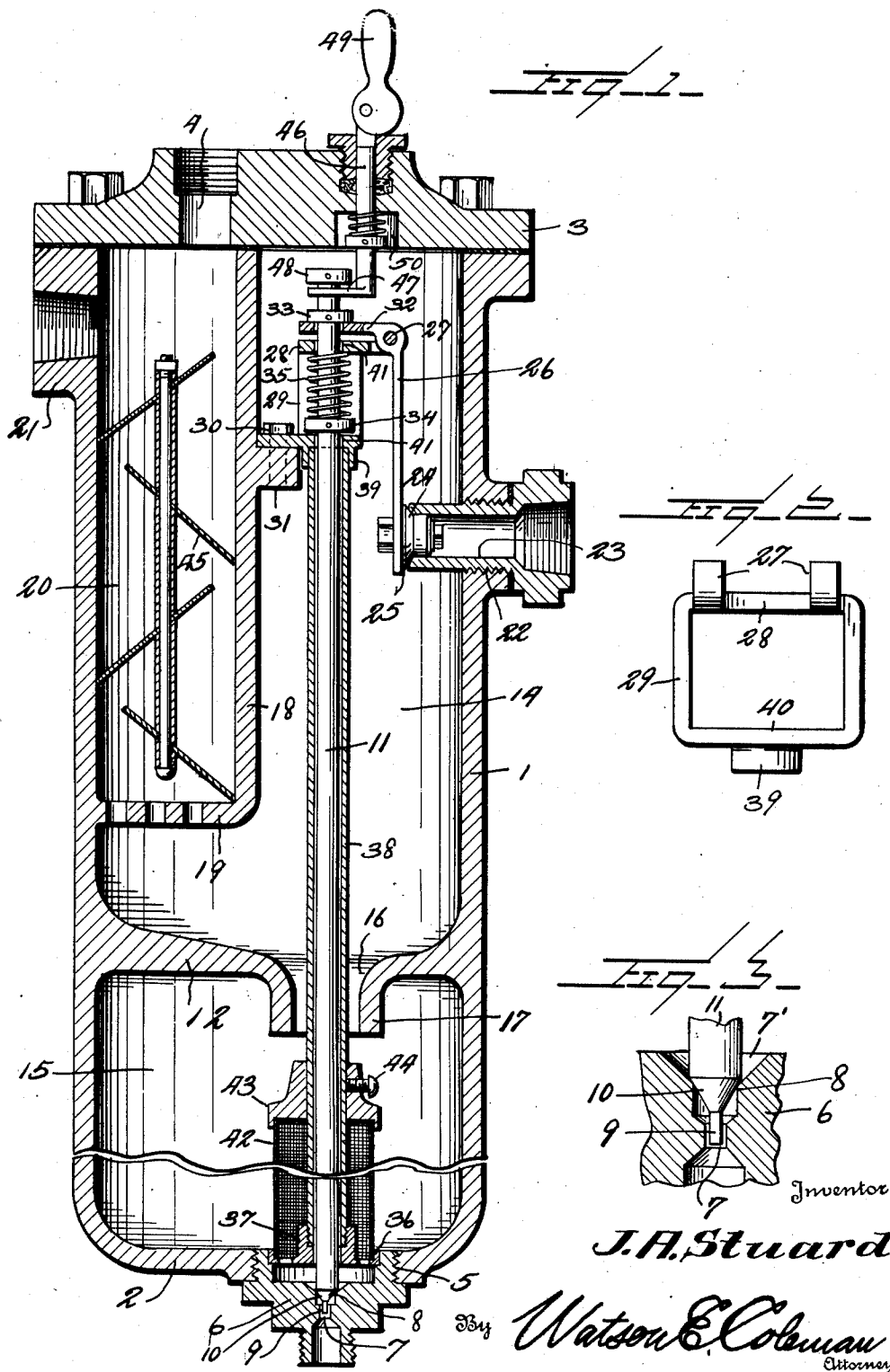
Dec. 5, 1933.

J. A. STUARD

1,937,855

SEPARATOR

Filed July 14, 1932



Inventor
J. A. Stuard

Watson E. Coleman
Attorney

UNITED STATES PATENT OFFICE

1,937,855

SEPARATOR

James A. Stuard, Roaring Spring, Pa.

Application July 14, 1932. Serial No. 622,551

25 Claims. (Cl. 183—40)

This invention relates to a separator and has relation more particularly to a device of this kind adapted to be interposed in an air pressure line and which operates to effectively separate from a flowing stream of compressed air moisture therein so that the air upon reaching a gun or other mechanism is substantially dry.

It is well known that air as it passes through a compressor takes more or less oil in the form of an oil vapor and that compressed air always contains a certain amount of moisture depending on the condition of the air first taken into the compressor. The invention has for an object to provide a separator for freeing the air of such moisture and oil so that the air upon arrival at its work is substantially dry.

An additional object of the invention is to provide a device of this kind wherein during the time the air is flowing through the separator the separated moisture and oil drains out of the separator but during periods the air is still such drain is closed thereby saving the air which would otherwise leak out with the drain.

A still further object of the invention is to provide a device of this kind adapted to be interposed in an air line and which embodies an automatic drain, the operation of which being under control of the air passing through the line in which the separator is arranged.

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 view in front elevation of a bracket member herein employed in connection with the valve mechanism;

Figure 3 is an enlarged fragmentary view illustrating in detail the features of the valve member and its coacting seat.

As disclosed in the accompanying drawing, my improved separator comprises a casing or shell 1 of preferred dimensions and configuration and having one end 2 permanently closed while the opposite end has associated therewith a removable cover 3. The cover 3 has disposed there- through a port 4 with which is adapted to be

associated any desired pressure gauge while the closed end 2 has disposed therethrough an opening 5 into which is threaded or otherwise engaged a plug 6.

The central portion of this plug 6 has directed therethrough a drain opening 7, the inner portion of which being enlarged to provide a feather valve seat 8. The portion 7' of the opening above or inwardly of the valve seat 8 is inwardly tapered so that any particles, such as scales, which may be received therein will readily pass to the intermediate restricted portion of the opening 7 so that said matter may be readily forced through said restricted portion by the needle extension 9 carried by the tapered valve extremity 10 of the elongated valve rod 10. The periphery of the tapered valve extremity 10 is on such an angle with respect to the angle of the tapered portion 7' whereby the desired feather seat 8 is assured.

The lower portion of the casing or shell 1 has disposed thereacross a partition 12 dividing the interior of the casing or shell 1 into an upper expansion chamber 14 and a lower elimination chamber 15. These two chambers are in communication through a suitably positioned opening 16 provided in the partition 12 and which opening 16 is herein disclosed as being defined by a surrounding nipple 17 extending into the chamber 15.

The upper portion of the chamber 14 to one side of its axial center and for a major portion thereof is intersected by a partition 18, said partition extending from the top of the casing or shell 1 to a point spaced from but in relatively close proximity to the partition 12. The lower or inner end of the partition 18 is continued by a perforated bottom plate 19 bridging the space between said plate 19 and the adjacent portion of the wall of the casing or shell 1 closest adjacent thereto.

The partition 18 and the plate 19 coact with this portion of the wall of the casing or shell 1 to provide a baffling chamber 20. The upper portion of the baffling chamber 20 has in communication therewith an outlet port 21 while the expansion chamber 14 has in communication therewith an inlet port 22.

Threaded through the port 22 is a nipple 23, the outer end portion of which being adapted to be coupled to the air line while the inner or inserted end of the nipple is formed to provide a valve seat 24 with which engages the valve member 25. The valve member 25 is carried by an end portion of a rock arm 26, the opposite end portion of which being pivotally connected, as at 27, to the upper member 28 of a rectangular bracket 29. This bracket 29 is anchored, as at 30, to a lug 31 extending into the chamber 14 from the partition 18. The pivoted end portion of the arm 26 is continued by substantially

a perpendicularly related plate 32 through which is freely directed the upper or inserted end portion of the applied rod 11. This plate 32 has contact with the inner face of the head or enlargement 33 carried by the rod 11 so that upon swinging movement of the arm 26 in a direction away from the seat 24 the rod 11 will have endwise movement in a direction to unseat the valve extremity 10 from its seat 8 so that as the air passes through the chambers 14 and 20 the moisture and oil separated therefrom and collecting within the chamber 15 will readily drain out through the drain opening 7.

The rod 11 within the bracket 29 has secured thereto a second head or enlargement 34 and interposed between said head or enlargement 34 and the member 28 of the bracket 29 is an expansible member 35, herein disclosed as a coil spring, encircling the rod 11.

This spring 35 is of such tension, when the flow of air through the chamber 14 ceases, to return the valve extremity 10 to its seat and at the same time return the valve member 25 to its seat. When the valve member 25 is in closed position back flow is prevented of air through the chambers 20 and 14.

Fitting within the upper portion of the plug 6 is a spider 36 the hub 37 of which constitutes a socket into which is threaded or otherwise engaged an end portion of a tubular member 38. The opposite end portion of this member 38 is adapted to slip within a sleeve or nipple 39 depending from the lower member 40 of the frame bracket 29. The member 38 is of such a length when the plug 6 is in applied position to positively hold the spider 36 in proper placement with respect to the plug 6. The rod 11 is freely directed through the hub of the spider 36 through the member 38 and suitably positioned openings 41 provided in the upper member 28 and the lower member 40 of the frame bracket 29. The applied spider 36 provides a seat for a cylindrical screening unit or element 42 of desired dimensions and which element 42 is held in place by a cap 43 engaging the screening element 42 from above and held in desired locking or holding position by a clamping screw 44.

This screening or separating unit 42 and its associated parts for the drain or vent opening 7 is not claimed in this application but claims on this feature are comprised in my application Serial No. 695,031, filed October 24, 1933.

When it is desired to clean out the chamber 15 it is only necessary to remove the plug 6 and as said plug is withdrawn the screening element 42 together with the tubular member 38 will readily pass out through the opening 5.

The chamber 20 as herein disclosed has mounted therein a series of spaced baffles 45, said baffles serving to effect a further separation of such moisture or oil as may be carried with the air into the chamber 20.

When the air line is open at the induction side of my improved device the incoming air entering through the port 22, or more particularly the nipple 23, will force the valve member 25 into open position and at the same time swing the plate 32 in a direction to open the flow through the drain opening 7. As the air enters the chamber 14 it will expand resulting in the effective separation of the moisture and oil carried by such air. This separated moisture and oil will pass through the opening 16 into the elimination chamber 15 and pass out through the drain opening 7. Upon closing off the flow of the air into

the induction side of the device the spring 35 will promptly throw the rod 11 to bring the valve extremity 10 to its seat and at the same time return the valve member 25 to its seat. With the drain opening 7 closed there will be no leakage of air during the periods the air line is closed thus saving the air which would otherwise be lost in the event the opening 7 was at all times open.

When the air line is open there may occur a slight leakage of air out through the opening or vent 7 but this loss of air is negligible due to the fact that the diameter of this opening or vent 7 is considerably smaller than the diameter of the bore of the nipple 23.

It is to be stated at this time that the opening or vent 7 in addition to providing a drain opening also serves to prevent the forming of a vacuum within the elimination chamber 15 which is highly essential when the line is open. A closed receptacle cannot act as a trap for oil and water.

As is believed to be clearly understood the baffles 45 serve to prevent passage of suspended moisture still in the air as it leaves the chamber 14.

Slidably disposed through the cover 3 is a plunger 46 the inner or inserted end portion of which coacting, as at 47, with a head or enlargement 48 carried by the rod 11 whereby upon outward movement of the plunger 46 the rod 11 may be manually operated at will to open the drain opening 7. As herein disclosed the outer end portion of the plunger 46 has coacting therewith an operator 49 of the general nature of an eccentric lever and the plunger 46 is normally maintained in an inoperative position by an expansible member 50 coacting with the cover 3 and the plunger 46.

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 having an inlet and an outlet for the air and divided to provide a lower elimination chamber to receive the moisture separated from the flowing air, the wall of the elimination chamber having a drain opening, means normally closing said drain opening, and means within the casing operated by the air when flowing through the apparatus to maintain open the drain opening, said drain opening serving, when open, to provide a vent to prevent a vacuum forming within the elimination chamber.

2. An apparatus for separating moisture from a flowing stream of compressed air comprising a casing having an inlet and an outlet through which said air flows, said casing having an elimination chamber to receive the moisture separated from the air flowing through the casing, the wall of said elimination chamber having a drain opening, a valve for said drain opening, means under control of the air when in transit through the casing to maintain said valve in open position,

and means for closing said valve upon stopping of the air flow.

3. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and exit whereby such air may flow therethrough, said casing having an elimination chamber to receive the moisture separated from the air, a wall of said elimination chamber having a drain opening, a valve member normally closing said opening, a rock member positioned for movement in one direction upon flow of air into the casing through the inlet, and an operative connection between said rock member and the valve member for moving the valve member into open position upon such movement of the rock member.

4. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and exit whereby such air may flow therethrough, said casing having an elimination chamber to receive the moisture separated from the air, a wall of said elimination chamber having a drain opening, a valve member normally closing said opening, a rock member positioned for movement in one direction upon flow of air into the casing through the inlet, an operative connection between said rock member and the valve member for moving the valve member into open position upon such movement of the rock member, and a valve carried by said rock member closing the inlet against retrograde flow therethrough when the valve member is in closed position.

5. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and exit whereby such air may flow therethrough, said casing having an elimination chamber to receive the moisture separated from the air, a wall of said elimination chamber having a drain opening, a valve member normally closing said opening, a rock member positioned for movement in one direction upon flow of air into the casing through the inlet, an operative connection between said rock member and the valve member for moving the valve member into open position upon such movement of the rock member, and means operating independently of the rock member for moving the valve member into open position.

6. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing divided into an expansion chamber, a baffle chamber and an elimination chamber, the baffle chamber being in communication with the expansion chamber and the elimination chamber being also in communication with the expansion chamber, said casing having an inlet in communication with the expansion chamber, an outlet in communication with the baffle chamber, the wall of the elimination chamber having a drain opening, means for normally maintaining the drain opening closed, and means entirely operated by the air when in transit through the expansion chamber to open the drain opening, said opening also providing a vent to prevent vacuum forming in the elimination chamber.

7. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and exit whereby such air may flow therethrough, said casing having an elimination chamber to receive the moisture separated from the air, a wall of said elimination chamber having a drain opening, a valve member normally closing said opening, a rock member positioned for movement in one direction

upon flow of air into the casing through the inlet, an operative connection between said rock member and the valve member for moving the valve member into open position upon such movement of the rock member, and means under control of the rock member for closing the inlet against retrograde flow therethrough when the valve member is in closed position.

8. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an outlet for the air and divided to provide a lower elimination chamber to receive the moisture separated from the flowing air, the wall of the elimination chamber having a drain opening, means normally closing said drain opening, means operated by the air when flowing to maintain open the drain opening, and means for preventing retrograde flow through the inlet when the drain opening is closed against discharge.

9. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing divided into an expansion chamber, a baffle chamber and an elimination chamber, the baffle chamber being in communication with the expansion chamber and the elimination chamber being also in communication with the expansion chamber, said casing having an inlet in communication with the expansion chamber, an outlet in communication with the baffle chamber, the wall of the elimination chamber having a drain opening, means for normally maintaining the drain opening closed, means operated by the air when in transit through the expansion chamber to open the drain opening, and means to prevent retrograde flow through the inlet when the drain opening is closed against discharge.

10. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an outlet for the air stream and also having a vent opening, a valve for the vent opening, means entirely controlled by the flow of the air stream for maintaining the valve in open position while the air stream is flowing, and means for moving the valve to close the vent opening when the air flow is stopped.

11. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an outlet for the air stream and also having a vent opening, a valve for the vent opening, means entirely controlled by the flow of the air stream for maintaining the valve in open position while the air stream is flowing, means for moving the valve to close the vent opening when the air flow is stopped, and separate means for holding the valve member in open position and against the action of the last named means.

12. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an outlet for the air stream and also a vent opening, a valve for the vent opening, means within the casing operated by the air stream when flowing for maintaining the valve in open position, said valve returning to closed position when the air flow is stopped.

13. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an outlet for the air stream and also a vent opening, a valve for the vent opening, means within the casing operated by the air stream when flowing for maintaining the valve in open position, said valve returning to

closed position when the air flow is stopped at a point beyond the outlet of the casing.

14. An apparatus for separating moisture from a flowing air stream comprising a casing having an inlet and an outlet to allow the air stream to flow through the casing, said casing also having an opening to break the suction action of the air stream flowing through the casing to allow separation of the moisture from the air stream, means closing said vent opening when the air stream is stopped, and means entirely controlled by the flowing air stream to maintain the vent opening open.

15. An apparatus for separating moisture from a flowing air stream comprising a casing having an inlet and an outlet to allow the air stream to flow through the casing, said casing also having an opening to break the suction action of the air stream flowing through the casing to allow separation of the moisture from the air stream, means closing said vent opening when the air stream is stopped, and means entirely controlled by the flowing air stream to maintain the vent opening open, said vent opening also providing a drain opening for the separated moisture.

16. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing through which the air stream passes and having a vent opening to allow precipitation of moisture in the air stream as said stream flows through the casing and automatically operating means for closing said vent opening when the flow of the air stream through the casing is stopped.

17. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing through which the air stream passes and having a vent opening to allow precipitation of moisture in the air stream as said stream flows through the casing, automatically operating means for closing said vent opening when the flow of the air stream through the casing is stopped, and means directly acted upon by the air stream for maintaining said vent opening open during the period the air stream is flowing.

18. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing through which the air stream passes and having a vent opening to allow precipitation of moisture in the air stream as said stream flows through the casing, automatically operating means for closing said vent opening when the flow of the air stream through the casing is stopped, and means within the casing directly acted upon by the air stream for maintaining said vent opening open during the period the air stream is flowing.

19. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an outlet for the air stream and also having a vent opening, a valve for the vent opening, means operated by the air stream as it enters the casing for maintaining the valve open while the air stream is flowing through the casing, and automatic means closing the vent opening upon stopping the flow of the air stream at a point beyond the outlet.

20. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an exit whereby said air stream may flow through the casing, said casing also having a vent opening, a valve member normally closing said vent opening, a member

positioned for movement in one direction upon flow of the air stream into the casing through the inlet, and an operative connection between said movable member and the valve member for moving the valve member into open position upon such movement of the movable member.

21. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an exit whereby said air stream may flow through the casing, said casing also having a vent opening, a valve member normally closing said vent opening, a member positioned for movement in one direction upon flow of the air stream into the casing through the inlet, an operative connection between said movable member and the valve member for moving the valve member into open position upon such movement of the movable member, and a valve carried by said movable member closing the inlet against retrograde flow therethrough when the valve member is in closed position.

22. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an exit whereby said air stream may flow through the casing, said casing also having a vent opening, a valve member normally closing said vent opening, a member positioned for movement in one direction upon flow of the air stream into the casing through the inlet, an operative connection between said movable member and the valve member for moving the valve member into open position upon such movement of the movable member, and means operating independently of the movable member for moving the valve member into open position.

23. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an exit whereby such air stream may flow therethrough, said casing also having a vent opening, a valve member normally closing said vent opening, a member positioned for movement in one direction upon flow of air into the casing through the inlet, and an operative connection between said movable member and the valve member for moving the valve member into open position upon such movement of the movable member, and means under control of the movable member for closing the inlet against retrograde flow therethrough when the valve member is in closed position.

24. 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, means normally closing said vent opening, means operated by the air stream when flowing to maintain open the vent opening, and means for preventing retrograde flow through the inlet when the vent opening is closed against discharge.

25. An apparatus for removing moisture from a flowing stream of compressed air comprising a casing having an inlet and an outlet for the air stream and also having a vent opening, a valve for the vent opening, means entirely controlled by the flow of the air stream for maintaining the valve in open position while the air stream is flowing, means for moving the valve to close the vent opening when the air flow is stopped, and separate means for holding the valve member in open position.

JAMES A. STUARD.