W. M. BOWLES.

SAFETY VENT FOR OIL STORAGE TANKS.

APPLICATION FILED MAR. 5, 1918.

1,298,872.

Patented Apr. 1, 1919.

2 SHEETS—SHEET 1.

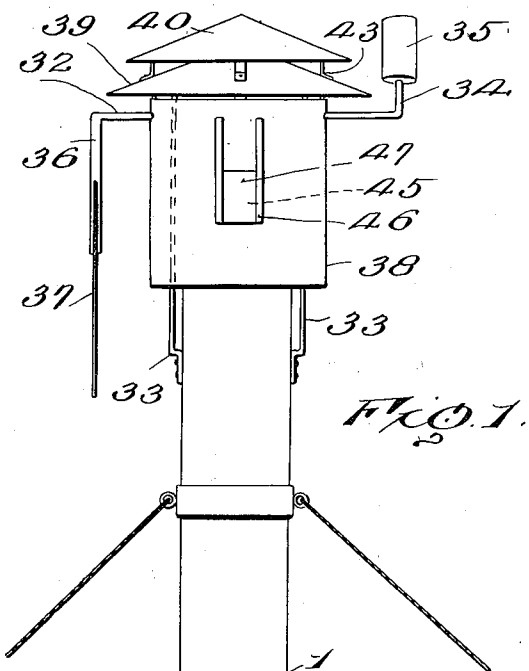


FIG. 1.

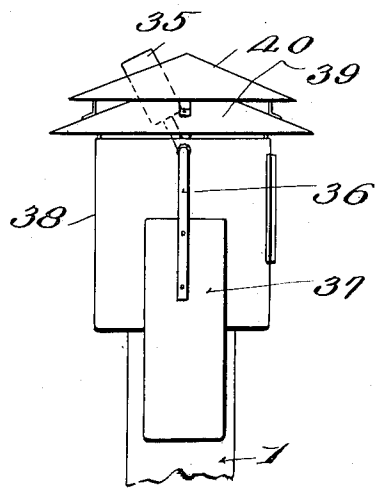
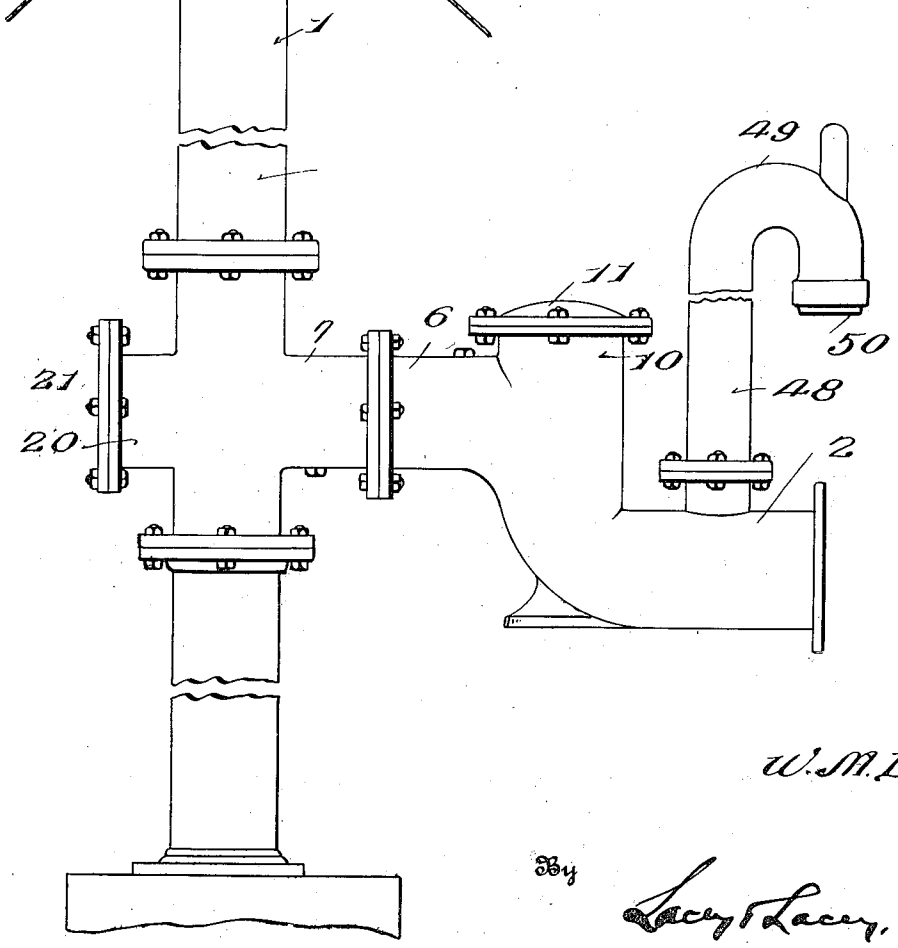


FIG. 2.



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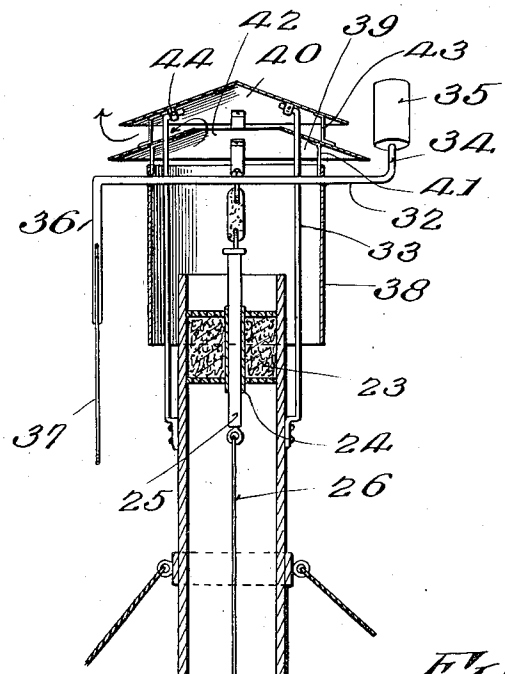


FIG. 3.

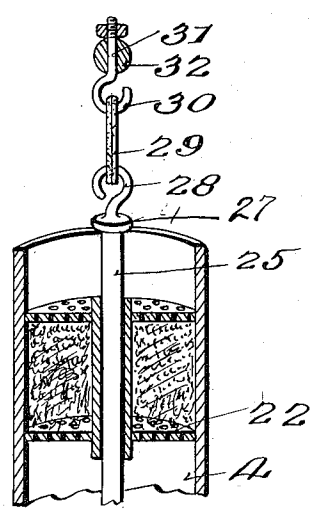
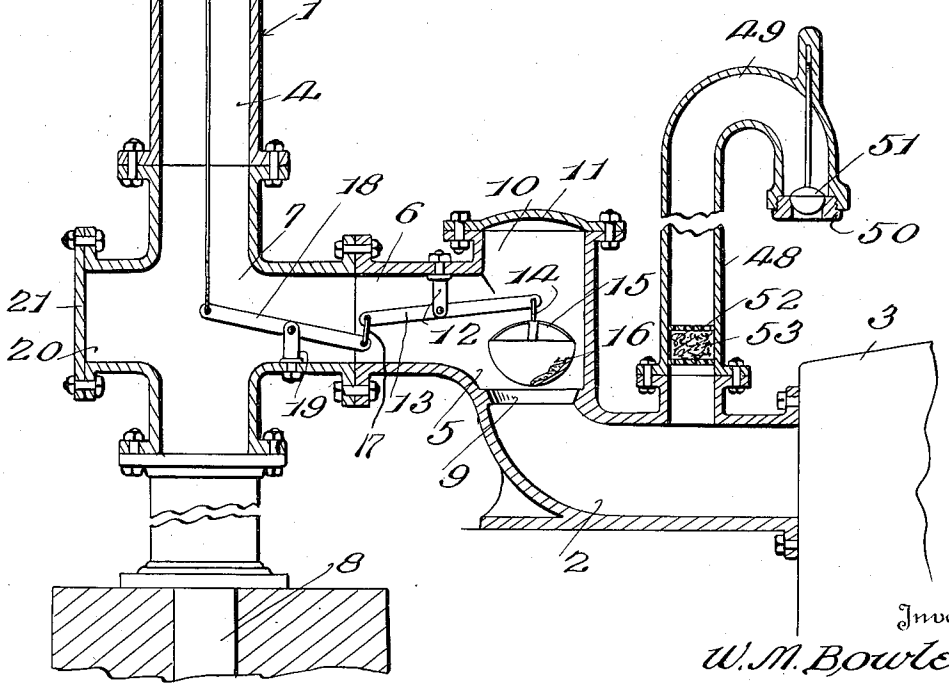


FIG. 4.



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SAFETY-VENT FOR OIL-STORAGE TANKS.

1,298,872. Specification of Letters Patent. Patented Apr. 1, 1919.

Application filed March 5, 1918. Serial No. 220,531.

To all whom it may concern:

Be it known that I, WILLIAM M. BOWLES, a citizen of the United States, residing at Shawnee, in the county of Pottawatomie and State of Oklahoma, have invented certain new and useful Improvements in Safety-Vents for Oil-Storage Tanks, of which the following is a specification.

This invention relates to safety vents for oil storage tanks.

It is a well-known fact that great loss and damage is frequently caused by storage tanks in an oil field being struck by lightning or by the occurrence of prairie or other fires in the vicinity of such tanks, the escaping vapors from the oil within the tanks becoming ignited and setting fire to the oil itself. The present invention is, therefore, designed to provide such a tank with a vent and to provide within the vent means for automatically closing the same immediately upon ignition of the gases rising through the vent either from lightning or the occurrence of fire in the vicinity of the vent.

The present invention is designed more especially as an improvement over the structures shown in my prior patent issued November 30, 1915, No. 1,162,019, my patent issued September 4, 1917, No. 1,238,983, and my co-pending application filed February 7, 1916, Serial No. 76,699, allowed October 27, 1917. In each of my prior structures, as in the present case, a valve is provided for closing the vent under the conditions above mentioned and a connection is provided between this valve and a fusible link, for the purpose of normally holding the valve open, the fusing of the link resulting, however, in release of the valve for immediate closing. In the prior structures, I have found by actual experience, that when a strong wind is blowing the flames from the burning gases rising through the vent are liable to be blown away from the link so that under such conditions a considerable time may elapse before the link becomes fused. It is, therefore, one of the primary aims of the present invention to provide in connection with such a valved vent as above referred to, means for confining the flames from the burning gases, to the vicinity of the fusible link ever though a strong wind be blowing at the time.

Also in the previously employed structures, as in the instance of the present invention, means is provided within the vent for preventing a back flash of the flames from the burning gases, this means being preferably in the nature of a packing of glass wool or the like arranged between foraminous heads within the vent. The use of such a means, I have found to be very effectual in accomplishing the desired result but I have also found on the other hand that the effectiveness of such means is liable to be impaired in rainy and cold weather as ice or frost is liable to accumulate within the packing and thus prevent the escape of the gases from the vent. Therefore, the invention also has as one of its aims to provide means for effectually preventing the accumulation of ice, frost, snow or rain in the packing or in the vent above the packing.

I have also found that there is likelihood of moisture accumulating around the valve and seat and freezing so as to either cause sticking of the valve or prevent its proper seating should the link become fused and should the valve be located in the vertical branch of the vent pipe as in the previously designed structures. It is, therefore, a further aim of the present invention to so arrange and construct the valve and its seat as to prevent the accumulation of moisture around these parts and thereby obviate any likelihood of the valve sticking or failing to effectually close the vent under the conditions above mentioned.

The invention further aims to so construct the valve and arrange the same that the weight of the valve may be readily and conveniently increased so as to insure of forceful closing of the same.

In connection with the vent of the present invention there is provided, as in the instance of one of my former structures, an intake branch through which air may enter when oil is being pumped from the tank, or for admitting air into the tank in the event of partial condensation of the gases within the tank due to temperature changes

and in the event that the main valve for closing the vent has been released. In this connection the invention has as a further object to provide in the intake branch of the vent, means for preventing the communication of flame with the oil within the tank should there be fire in the vicinity of the said intake branch.

In the accompanying drawings:

Figure 1 is a side elevation of the vent embodying the present invention;

Fig. 2 is a similar view of the upper or discharge end of the vent and looking at another side thereof;

Fig. 3 is a vertical longitudinal sectional view through the vent;

Fig. 4 is a sectional perspective view illustrating the manner of connecting the fusible link with the parts between which it extends.

The vent pipe which is indicated in the drawings in general by the numeral 1, includes a horizontal branch 2 which leads from the storage tank, indicated by the numeral 3, and a vertical branch 4 which leads upwardly from the outer end of the branch 2. The branch 2 is secured in any suitable manner at its inner end to the wall of the tank 3 and, of course, communicates with the interior of the tank so as to carry off the gases rising from the oil within the tank. For a short distance the branch 2 leads horizontally preferably substantially at the ground surface, and then extends a short distance upwardly as indicated by the numeral 5, and thence again horizontally for a short distance, as indicated by the numeral 6. To the end of the portion 6 of the branch 2 is connected a short intake neck or branch 7 located at the lower end of the vertical branch 4 so that the gases rising from the oil within the tank 3 may pass through the branch 2 and into the vertical branch 4 and thence to the atmosphere. The vertical branch 4 is supported at its lower end in any suitable manner and preferably communicates with a sump 8 designed to receive and collect any vapors condensing in the said branch 4. Within the upwardly extending portion of the branch 2 there is formed a valve seat which is indicated by the numeral 9 and this portion of the branch is provided in its top with an opening 10 through which access may be had to the seat 9 for the purpose of clearing the same of obstructions and also for a further purpose to be presently explained. This opening 10 is normally closed by a suitable cap 11 bolted or otherwise secured in place. A bracket 12 is mounted in the upper side of the portion 6 of the branch 2 of the vent pipe and pivotally supported upon this bracket is a rock arm 13. A link 14 is connected to that end of the arm 13 which extends within the portion 5 of the branch 2 and the said link carries a bail 15 which in turn supports the valve for the vent which valve is indicated by the numeral 16. The valve 16 normally has a tendency to fall by gravity to position resting upon the seat 9, and by reference to Fig. 3 of the drawings it will be observed that this valve is of hollow semi-spherical form, its open side being presented upwardly and located directly beneath the opening 10. Consequently by removing the cap 11 from the opening 10, molten lead or other material may be poured or introduced into the body of the valve 16 so as to suitably weight the same and thus any desired weight may be given the said valve. The other end of the arm 13 is connected by a suitable link 17 with one end of a rock arm 18 which end of the rock arm extends beneath the said end of the arm 13 as shown in the said Fig. 3. The rock arm 18 is mounted pivotally upon a bracket 19 mounted at the lower side of the portion 7 of the vertical branch 4 of the vent pipe and the other end of the arm 18 extends into the lower portion of the said branch 4 preferably to the vertical axis of the said branch. In order that access may be had to the arms 13 and 18, the vertical branch 4 is provided opposite the branch 7 with a short branch 20, and a cap plate or head 21 is removably secured to the said branch 20 to close the same. At this point it will be understood that the valve 16 and its seat 9, instead of being located directly within the vertical branch 4 of the vent pipe and therefore in position to receive accumulations of moisture liable to interfere with proper functioning of the valve, are located within the horizontal branch of the said vent pipe and, consequently, in such position that vapors condensing within the vertical branch 4 will not reach the valve and its seat.

In order to prevent flames from the ignited gases communicating with the gases in the lower portion of the vertical branch 4 of the vent pipe, spaced foraminous heads 22 are mounted in any suitable manner within the upper portion of the branch 4 and the space between these heads is filled with a packing 23 of glass wool or any other suitable material pervious to the gases but at the same time capable of performing the function stated. A short tube 24 is fitted vertically axially through the foraminous heads 22, and snugly and yet slidably fitting within this tube is a cylindrical rod 25 to which is connected the upper end of a wire or other similar flexible or semi-flexible connection 26, the lower end of this wire being connected to the last described end of the arm 18 as clearly shown in Fig. 3 of the drawings. In order to limit the downward movement of the rod 25 within the tubular guide 24, the said rod is provided at its upper end with a collar or shoulder 27, designed in the downward movement of the

rod to strike against the upper end of the said tubular guide 24. Above the collar or shoulder 27, the rod 25 is provided with a hook or eye 28 with which is engaged one end of a fusible link 29. This link 29 is of any suitable type, comprising in the present instance parts which are held together by a bond of some fusible metal which when fused by the heat from the ignited gases, will allow the said parts to separate as will be readily understood. The upper end of the link 29 is connected with a hook or eye 30 carried by a short arm 31 secured in any suitable manner through or to a shaft 32. As shown in Fig. 4 of the drawings, the arm 31 is fitted through an opening in the said shaft and a nut is applied to the end of the arm and serves to secure the arm to the shaft. The shaft 32 is rotatably mounted in bearings formed or provided upon upstanding uprights 33 preferably in the nature of bars secured in any suitable manner at their lower ends to the outer side of the section 4 of the vent pipe at diametrically opposite points. These uprights extend above the upper end of the said branch of the vent pipe so that the shaft itself is supported above the said end of the said branch. At this point it will be understood that the weight of the valve 16 and the tendency of the valve to move by gravity to closed position upon the seat 9, results, through the system of lever arms 13 and 18, in a downward pull being exerted upon the connection 26 and, consequently, upon the rod 25 and fusible link 29. Normally, however, the parts are so adjusted that the valve will be supported above its seat so that the gases rising from the oil within the tank 3 may have unobstructed passage through the vent pipe to the atmosphere. It will be apparent, however, that should the gases become ignited in the vicinity of the link 29, the link will be fused, its parts will separate, the rod 25 will immediately be released for downward movement through the guide 24, and the valve 16 will thus be released for immediate closing movement.

The shaft 38 also constitutes an element of a means provided for giving visible signal when the valve has been automatically released for closing movement under the conditions above described and for this purpose the shaft is provided at one end with an arm 34 which normally extends obliquely upwardly and carries a weight 35, and at its other end the said shaft is provided with an arm 36 normally extending vertically downwardly and carrying a signal vane or blade 37. Due to the pull exerted by the weight of the valve, upon the connection 26, rod 25, and fusible link 29, the shaft 32 is normally held against rotation in its bearings and under such circumstances the arms 34 and 36 will occupy the positions stated. However, there is a normal tendency for the weight 35 to overbalance the said shaft 32 and, consequently, when the fusible link 29 has become fused, the shaft 32 will be released for rotation and the arm 35 will swing downwardly through gravity to rotate the said shaft and thus swing the arm 36 and the signal vane or blade 37 to approximately a horizontal position.

As has before been stated, means is provided for confining the flames from the burning gases to the vicinity of the link 29 so as to insure a prompt fusing of this link and therefore the practically immediate automatic release of the valve for closing movement, and this means includes a hood comprising a cylindrical body 38 and cowls 39 and 40 which are supported above the upper end of the said body 38. The cowl 39 is supported immediately above the open upper end of the body 38 by means of brackets 41 upstanding from the said body, and is provided centrally with a draft opening 42, and the cowl 40 is similarly supported by brackets 43 which upstand from a cowl 39, the cowl 40, however, being imperforate and completely covering the opening 42 although spaced above the said opening and bodily above the cowl 39. The hood in its entirety is supported in position by means of the uprights 33, the upper ends of which uprights extend through the cowl 39 at the opposite sides of the opening 42 and are bolted or otherwise secured as at 44 to the under side of the cowl 40. The hood 38 is so disposed that the lower portion of the body thereof will surround the upper portion of the vertical branch 4 of the vent pipe, the said lower portion of the body of the hood being, however, of such diameter that it will be spaced a suitable distance from the said upper portion of the branch 4 of the vent pipe so as to permit of the up-draft of the air currents through the hood. In one side, the hood body 38 is provided with an opening 45, at the opposite sides of which are arranged guides 46. A slidable closure 47 is fitted at its lateral edges in the guides 46 and, consequently, may be moved vertically into and out of position to close the opening 45. Through this opening access may be readily had to the interior of the hood so as to permit of the removal from the hooks 28 and 30 of the separated parts of a fused link and the substitution of a new link. From the foregoing it will be understod that not only does the hood serve to prevent the entrance of snow and rain into the branch 4 of the vent pipe, but it also serves to localize the flames from the burning gases even when a high wind is blowing so that these flames will be confined to the vicinity of the link 29 and will, therefore ,result in quick fusing of the link. Furthermore, the hood serves to prevent moisture reaching the packing 23 and

there freezing and clogging this portion of the device.

Leading upwardly from the horizontal branch 2 of the vent pipe at a point between the tank 3 and the valve seat 9, is an intake branch indicated by the numeral 48, this branch having its upper portion turned over as at 49 so that the inlet end of the branch will be presented toward the ground surface. A valve seat 50 is arranged within the intake end of the branch 48, and a jet valve 51 normally rests by gravity upon this seat but is designed, of course, to lift to admit air to the tank 3 in the event the valve 16 has been released and has moved to closed position upon its seat 9 and partial vacuum is created within the said vent tank either because of oil being pumped from the tank or because of changes in temperature resulting in a partial condensation of the gases within the tank. In connection with the intake branch 48, it is obviously desirable to provide some means for preventing flames, as for example from burning grass in the vicinity of the vent being drawn into the tank through the vent, and this means preferably comprises spaced foraminous heads 52 arranged within the lower portion of the intake 48 and having arranged between them a packing 53 of glass wool or similar material corresponding to the packing 23 heretofore described.

Having thus described the invention, what is claimed as new is:

1. The combination with a vent pipe for an oil storage tank provided interiorly with a valve seat, a valve for coaction with the seat, a fusible element located adjacent the outlet from the vent pipe, and connection between the fusible element and the valve normally holding the valve in open position, of a hood surrounding the outlet from the vent pipe and inclosing the said fusible element, the said hood being open at its bottom and being spaced from the vent pipe whereby to provide for a rising draft of air currents through the hood in the direction of the said fusible element.

2. The combination with a vent pipe for an oil storage tank provided interiorly with a valve seat, a valve for coaction with the seat, a fusible element located adjacent the outlet from the vent pipe, connection between the fusible element and the valve normally holding the valve in open position, of a hood surrounding the outlet from the vent pipe and inclosing the said fusible element, the said hood being open at its bottom and spaced from the vent pipe whereby to provide for a rising draft of air currents through the hood in the direction of the said fusible element, the hood being provided in its walls with an opening located opposite the fusible element, and means for closing the said opening.

3. The combination with a vent pipe for oil storage tanks having a branch leading substantially horizontally from the tank and a branch leading substantially vertically from the first-mentioned branch and having an outlet, of a valve seat within the first-mentioned branch of the pipe, a valve arranged to lower by gravity onto the said seat, a fusible element located adjacent the discharge end of the said vertical branch of the pipe, and connection between the said fusible element and the said valve.

4. The combination with a vent pipe for oil storage tanks having a branch leading substantially horizontally from the tank and a branch leading substantially vertically from the first-mentioned branch and having an outlet, of a valve seat within the first-mentioned branch of the pipe, a valve arranged to lower by gravity onto the said seat, a fusible element located adjacent the discharge end of the said vertical branch of the pipe, a system of lever arms arranged within the first-mentioned branch of the pipe, one arm of the said system supporting the said valve, and connection between another arm of the system and the said fusible element.

5. The combination with a vent pipe for oil storage tanks having a substantially horizontal branch provided interiorly with a valve seat, a valve located within the branch for coaction with the seat, and fusible means for holding the valve normally in open position, the said valve comprising a body provided in its upper side with a receiving concavity, and the said branch being provided with an opening whereby access may be had to the interior of the valve body.

6. The combination with a vent pipe for an oil storage tank provided interiorly with a valve seat and a valve for coaction with the said seat, of an overbalanced shaft mounted above the outlet from the pipe, a connecting element leading from the valve, hook members upon the shaft and the said connecting element, and a fusible link having eyes engaged by the said hooks.

7. The combination with a vent pipe for an oil storage tank provided interiorly with a valve seat, and a valve for coaction with the seat, of supporting members upon the pipe extending upwardly beyond the upper end of the pipe, a hood comprising a body open at its bottom and surrounding the said upper end of the pipe and spaced therefrom, a cowl connected in spaced relation with the upper end of the said body, the said supporting member being connected with the cowl, a relatively fixed member located in the upper portion of the body above the upper end of the pipe, a fusible link supported from the said member, and a connecting element extending between the link and the valve.

8. In a device of the class described, a vent pipe, spaced foraminous heads in the

upper portion of the said pipe, a tubular guide extending through the heads, a valve seat within the vent pipe, a valve within the pipe, an element having connection with the valve, a rod slidably fitted through the tubular guide and to which the said element is connected, fusible means normally supporting the rod in elevated position whereby to hold the valve in open position through the medium of the connecting element, and an abutment upon the rod engageable, in the lowering movement of the rod, with the upper end of the tubular guide whereby to limit the said movement of the rod.

In testimony whereof I affix my signature.

WILLIAM M. BOWLES. [L. S.]