No. 879,577. PATENTED FEB. 18, 1908.

D. O'KEEFE.

FLASHBACK STOP.

APPLICATION FILED JAN. 7, 1907.

2 SHEETS—SHEET 1.

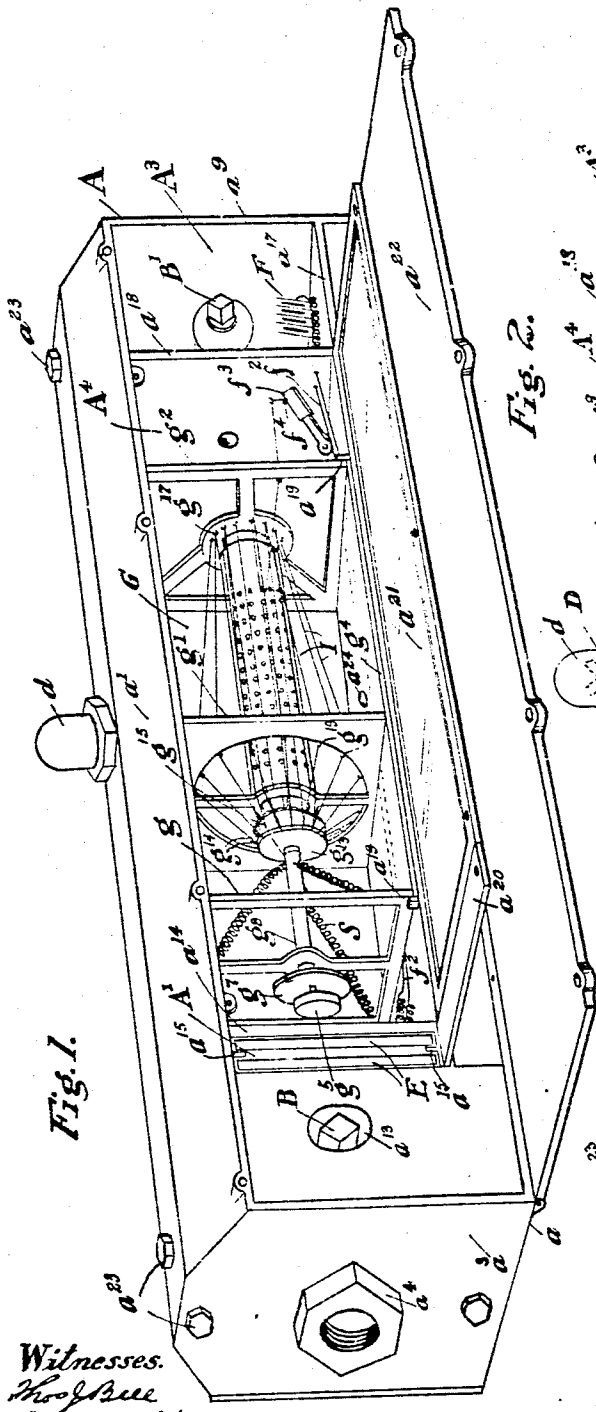

Fig. 1.

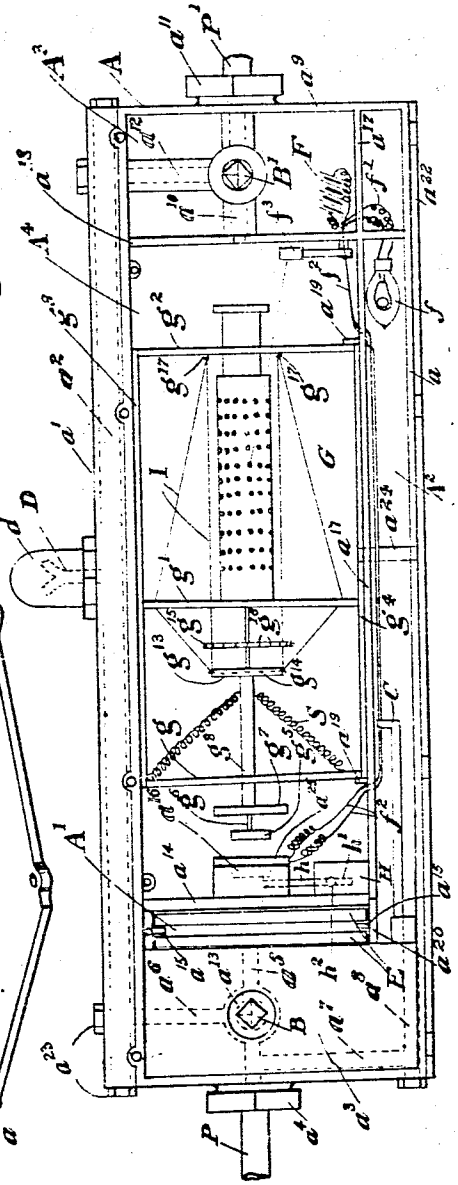

Fig. 2.

Witnesses.
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Henry Daniel Smith

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Daniel O'Keefe
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2 SHEETS—SHEET 2.

Fig 3

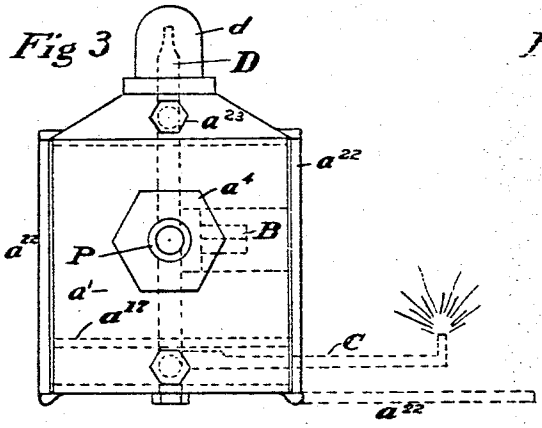


Fig. 13.

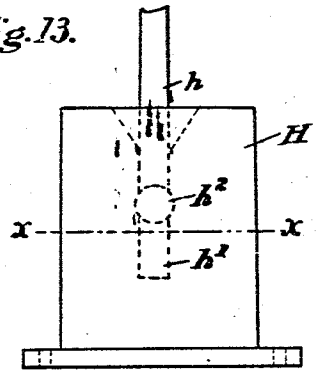


Fig. 4.

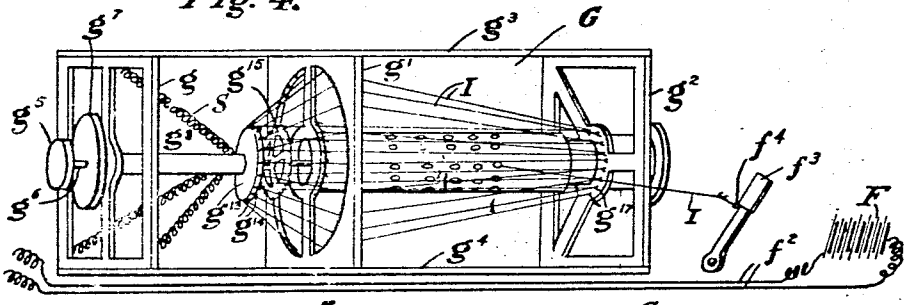


Fig. 5.

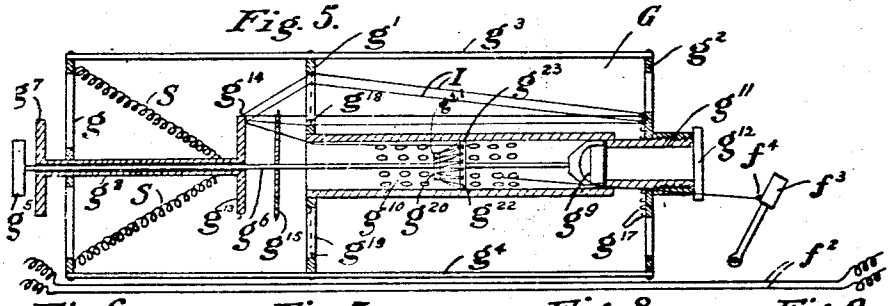


Fig 6.

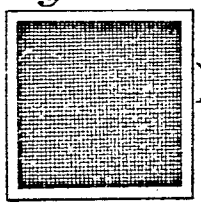


Fig. 7.

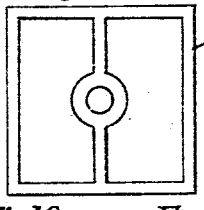


Fig. 8.

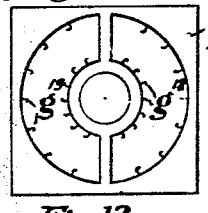
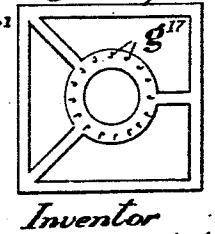


Fig. 9.



Witnesses.

Fig. 10

Fig. 11

Fig. 12

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UNITED STATES PATENT OFFICE.

DANIEL O'KEEFE, OF CINCINNATI, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AMERICAN ACETYLENE COMPANY, OF AUGUSTA, MAINE, A CORPORATION OF MAINE.

FLASHBACK-STOP.

No. 879,577. Specification of Letters Patent. Patented Feb. 18, 1908.

Application filed January 7, 1907. Serial No. 351,173.

To all whom it may concern:

Be it known that I, DANIEL O'KEEFE, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Flashback-Stops, of which the following is a specification.

My invention relates to safety devices adapted to prevent the flame from flashing back from the point of normal combustion, through its passage way to the container.

It is a well known fact that vapors, ethers, and carbid and other gases, including acetylene gas, when unimpeded and brought into contact with the oxygen of the air in certain proportions have a tendency to "flash-back" the flame from the point of normal combustion to the body of combustible material in the container, and in some cases to ignite by spontaneous combustion at the zone of combustion and flash-back. Heretofore most of the danger in handling such combustible materials has arisen in this way, and no effective means of overcoming the evil existed.

My invention is a flash-back stop, interposed at any convenient point between that of normal combustion and the container a d adapted to automatically arrest and shut off the flame in its progress toward the source of supply. It may be used where apparatus is stationary, as ordinary city and house lighting plants; where portable, as motor vehicles and trains; where aerial as in dirigible balloons in which case in time of war flexible connections from container to one or more quantities of explosives would permit their separate discharge without danger of the accidental discharge of any of the others, by the use of the "flashback" through the desired connection, and where submerged, as where container is on ship, or land; and zone of combustion is in a caisson, or mines to be exploded, there being suitable, flexible or other connections.

The particular embodiment of my invention selected for illustration, is a "flash back" stop for acetylene gas, in which:—

Figure 1, shows the assembled device in perspective. Fig. 2, is a side elevation of the assembled device. Fig. 3, is an exterior elevation of the entrance end, showing one side hinged down. Fig. 4, is a perspective of the stop plunger mechanism. Fig. 5, is a side elevation of the same in axial, longitudinal section. Fig. 6 is a detail of a screen. Figs. 7, 8, 9, 10, 11 and 12 are details of the stop plunger mechanism. Fig. 13, is a detail of the liquid seal.

Referring now to the drawings: A designates a frame of any suitable shape and material which in this case is a casting composed generally of the flat bottom a, the top a^1, the inlet end a^3 and the outlet end a^9. The top a^1 has its sides sloped to save material, and its central portion is cored longitudinally to form a passage way a^2 for gas. A gas burner D is tapped into the passage a^2, and covered with a cap d tapped into the top a^1. The inlet end a^3 has an exterior box a^4 shaped exteriorly for wrench contact and pierced axially and threaded to receive the inlet pipe P. Gas is conveyed from the inner end of this pipe through the passage a^5 to the interior of the frame, and from a^5, through passage a^6 to passage a^7, and from passage a^7 through passages a^7 and a^8 to the swinging gas bracket C. The outlet end a^9 is cored through to form a passage a^{10} from the central chamber through the exterior box a^{11}, which is threaded internally to receive the outlet pipe P'. Connected with the passage a^{10}, is a passage a^{12} leading to the passage a^7.

The flow of gas in the inner end of the passage a^5 and in passage a^6 is controlled by the three way cock B; it being apparent that whenever gas is in the inlet pipe P, passages a^7 and a^8 will be conveying the supply to the bracket C, which is provided with a revolving cock that opens by swinging the bracket outward. Cock B is accessible through the opening a^{13}. The flow of gas in the passages a^{10} and a^{12} is controlled by the three way cock B'.

A transverse partition a^{14} forms a chamber A' adapted to receive any suitable number of screens E, held in proper position by guides a^{15}. The screens are designed to take up moisture and dust; or when treated with chemicals may act as purifiers of the gas, and act as an additional deterrent to the backward passage of the flame. The partition a^{14} is shaped to form a seat a^{16} for the stop g^6 hereinafter described, and the flange a^{25} of the stop seat is faced off to form a seat for the secondary stop g^7 hereinafter described. A hole is bored from below through the circumferential boss of the partition a^{14} behind the seat a^{16}, and is tapped to receive a pipe h

which extends down into a vessel H bolted to the partition a^{17}. A pipe h^1 is connected to the pipe h by a ball joint h^2, so that various changes of position of the whole device will not fail to carry the open end of the pipe h^1 below the level of liquid, designed to be maintained in the vessel H, indicated by the line $x\,x$.

A longitudinal partition a^{17} forms the lower chamber A^2 into which the gas bracket C extends; also the electric light f hereinafter described. A transverse partition a^{18} forms the inner wall of the outlet end a^9, and incloses a chamber A^3 within which is that portion of the casting which contains the passages a^{10} and a^{12}, and an electric battery F. Suitable electrical connections f^1 connect the battery F and the light f, and others f^2 connect the battery and the stop-seat a^{16} to magnetize said seat. Wires f^1 are preferably insulated throughout, as are also wires f^2 except where exposed for switch contact. The battery and all connections may be omitted. Partitions a^{14} and a^{15} form a chamber A^4 adapted to receive the stop mechanism designated as a whole as G. Lugs or pins a^{19} on the bottom or top or both of the chamber A^4 hold stop mechanism G against accidental displacement.

Stop mechanism G made of metal or other non-combustible material consists of any suitable number of frames, (the three shown in the drawing g, g^1 and g^2 being a convenient number) held in place in any convenient manner as by top connection g^3, and bottom connection g^4. In line with the stop seat is the stop g^7 of suitable size and shape to fit in the seat a^{16} and prevent gas from passing through the partition a^{14} into the chamber A^4. This stop is carried on a piston rod g^6 which has a potential longitudinal motion through the secondary stop g^7 and its sleeve g^8 sufficient to carry the stop from its normal position shown in Fig. 2 to the seat. Rod g^6 carries on the end next the gas outlet orifice a piston g^{13} which fits the cylinder g^{10} and seats against the end of the smaller concentric cylinder g^{11}. The piston head g^9, which fits the cylinder g^{11} and said cylinder g^{11} are filled with some explosive as gun-cotton or fulminating powder, and are capped over by a screen g^{12} adapted to both retain and expose the explosive.

The cylinders g^{10} and g^{11} are held in position by the transverse frames g^1 and g^2. Sleeve g^8 on the piston rod g^6 loosely pierces the frame g and when not held the springs S carry it and its attached secondary stop g^7 toward the secondary seat a^{25}. Cylinder g^{10} may be perforated, to allow flame to quickly destroy the threads I hereinafter described, and through one of these perforations the thread passes out to the switch connection, as hereinafter described.

A switch f^3, adapted by its own weight to complete the electrical connection f^2, is located at any convenient point in the chamber A^4, and is provided with a hook f^4.

A circular member g^{14}, attached to the inner end of the sleeve g^8, carries a plurality of hooks g^{24}. Upon rod g^6, between hook frame g^{13} and frame g^1 is a circular member g^{15}, whose periphery is serrated, and the serrations g^{16} sharpened to cut threads which normally lie in them out of contact with their edges.

The outer edge of the central ring of the frame g^2, carries a plurality of hooks g^{17}. The openings in the plate g^1 carry a plurality of hooks, those on the inner edges designated as g^{18} and those on the outer edges as g^{19}. Fixed to the piston rod g^6 is a collar g^{20} carrying a plurality of hooks g^{21}. Adapted to fit snugly within the cylinder g^{10} is a spring ring g^{22}, carrying a plurality of hooks g^{23}. There should be a like number of hooks g^{24}, g^{17}, g^{18} and g^{19}, and serrations g^{16}; and they should all be in alinement as on radii of the rod g^6.

The stop mechanism G is removed and all the parts connected with the stop and secondary stop are pulled toward the inlet end of the mechanism exposing collar g^{20}. The spring ring g^{22} is carried in the same direction as the stops, and brought to rest near the inlet end of the cylinder g^{10} where its hooks can be readily gotten at; and where it will be the same distance from the collar g^{20} it is intended to remain when device is ready for use. Now a thread, or the like, I of suitable size and strength is carried into the inlet end of the cylinder, and the short end carried out through the desired perforation of the cylinder, and temporarily held by tying or otherwise. The other end of the thread is now taken and the thread carried back and forth from a hook g^{21} to a corresponding hook g^{23}, until all said hooks are filled; then all stops, rods and attachments and ring g^{22} are simultaneously pushed toward the outlet end of the mechanism, and the short end of the thread is tied to the hook f^4 of the switch f^3 so as to raise the switch and sustain its weight keeping it out of contact with the wires f^2. Meanwhile the other end of the thread has been held taut, and the thread is now passed from the last hook g^{23}, through one of the inner openings of the knife g^{15}, on to the appropriate hook g^{24} all parts being in the position shown in Fig. 5, thence to the alining hook g^{19}, thence to alining hook g^{17}, thence back to the appropriate hook g^{18}, thence through the proper serration g^{16} in the knife member g^{15}, over the proper hook g^{24}; and so on until all the hooks have been used, when the thread is carried over the edge of member g^{13} and secured as by tying around sleeve g^8. It will be seen that the primary stop is held no matter what the position of the device, and the secondary stop is held against the tension of the springs S.

When device is closed for operation, chamber A^2 is hermetically sealed from all others; chambers A^3 and A^1 have no communication except through passage a^{10}; and chambers A^1 and A^4 have no communication save through the axial port and the liquid seal. Suitable doors or covers a^{20} for tightly closing the chamber A^1 on either side, are provided. A glass door a^{21} on either side of the chamber A^4 fits leak-tight, so that the stop mechanism G may be examined without danger while the device is in operation. Outer doors a^{22} of metal or other suitable material, inclose both sides, and complete the outer case.

The exterior terminations of the several gas passages, cored into the casting, are bored, tapped and fitted with plugs a^{23} accessible from the exterior. A waste pipe a^{24} pierces the bottom, extends up through the chamber A^2 and is tapped through the partition a^{17}, connecting the chamber A^4 with the exterior. This pipe is provided with an exterior cap. (Not shown.)

When it is desired to test the flow of gas into the device from the inlet pipe, the bracket C may be swung out and flame applied to its jet; or the cock B may be properly set so as to open the by-pass, formed by the passages a^6 and a^2 (the cap d having been previously removed) and flame applied to the jet D. When it is desired to test the flow of gas from the device, cock B is set to cut out the by-pass, the cock B^1 is set to open its by-pass, formed by the passages a^{12} and a^2, and flame applied to the jet D. If the flashback stop mechanism is out of order, gas may be supplied to the zone of combustion through the by-pass.

The operation of the device is as follows:—All parts being in the position shown in Fig. 2, excepting that the doors a^{20} and a^{21} are assumed to be in position to confine gas to the several chambers A^1, and A^4; gas passes through the inlet pipe P, outer portion of the passage a^5, cock B, inner portion of the passage a^5, through the screens E and the axial port in the partition a^{14}, into the chamber A^4. Thence it enters the inner end of the outlet passage a^{10}, passes through the cock B^1, and the outer end of the passage a^{10} into the outlet pipe P^1 which conveys it to the zone of combustion, (not shown). Assume an improper mixture of air and gas at this point, causing an explosion;—the flame will "flash back" along the gas passages until it reaches the inner end of passage a^{10} opposite the screen g^{12}, covering the end of the cylinder g^{11} where the fulminating powder or other substance in said cylinder explodes, instantly carrying the piston g^9, rod g^6 and stop g^7 back so that the stop rests in the seat a^{16}, shutting off communication with the source of supply, and cutting off the flame therefrom. The magnetized stop-seat further tends to hold the stop in position, for impact of the explosion and the flame will have caused the thread f to be severed and the switch f^3 will have fallen, completing the battery connection f^2 with the stop seat. The severance of the thread will also release the secondary stop mechanism, and the springs S will carry said stop g^7 to its seat additionally sealing the aperture against communication between chambers A^1 and A^3. It will be seen that the thread will be broken by the force of the explosion, burned off by the flame and cut off by the knife g^{15}, for the explosion will impart a rotary motion to the piston and its rod g^6 to which latter the knife is fixed.

The liquid seal formed by the gas pipe h^1 with its open end immersed in the liquid, the height of which is indicated by the line x, x will supply gas under suitable pressure to the chamber A^4, after the stop has shut off the supply in the normal way. The flame can not "flash back" through a proper liquid seal and the flame within the chamber A^4 will almost immediately be extinguished, from exhaustion of the oxygen, which will be accelerated by the ignition of the explosive; and burned gases have a tendency to smother the flame. Where no device equivalent to the liquid seal is used, no gas combustion can be produced at the normal zone of combustion, until the stops are reset, the explosives or fulminates replaced and the thread resupplied as described;—while with the liquid seal added continuous and safe operation is secured; but this seal is in no way necessary to the proper and safe operation of my device.

It will be apparent that mechanism within the scope of my invention may vary widely from that herein described; therefore in furtherance and not in limitation of my invention as herein described and claimed; I expressly mention "flashback" stop mechanism actuated by explosion only; by explosion and electricity; by explosion and springs; by explosion, electricity and springs; each dependent upon or independent of either or both thread and thread cutter; also by springs released by flame; and all whether depending in part either or both upon the vacuum formed or the smothering effect of the fumes of fulminates and explosives.

I claim as my invention and desire to secure by Letters Patent of the United States.

1. A flashback stop comprising a permanent shell having an inlet and an outlet, and means disposed within said shell for closing said inlet said closing means being adapted to be actuated by the action of the flame of the flashback.

2. A flashback stop comprising a permanent casing, having a gas inlet and a gas outlet, a valve adapted to close said inlet, and means disposed within said casing for automatically actuating said valve said inlet clos-

ing means being adapted to be actuated by the flame of the flashback

3. A flashback stop comprising a permanent casing having a gas inlet and a gas outlet, a spring-actuated valve adapted to seat from within outwardly, and close said inlet, and means disposed within said casing for releasing said valve spring by the action of the flame of the flashback.

4. A "flashback" stop whose supply passage is normally open, explosives disposed in the path of the flame within the mechanism and mechanical means adapted to close said passage by explosives ignited by the "flashback".

5. A "flashback" stop whose supply passage is normally open, explosives disposed in the path of the flame within the mechanism and spring actuated stopping means adapted to be released by the explosives ignited by the "flashback".

6. A "flashback" stop whose inlet passage is normally open, explosives disposed in the path of the flame within the mechanism and a combination of inert and spring actuated stopping means adapted to close the inlet passage through the agency of explosives ignited by the "flashback".

7. Combined mechanical and electrical means for preventing the flashing back of flame in a gas passage, comprising mechanical means for maintaining the gas passage normally open said means adapted to be released by the flame as it flashes back through said passage, and the simultaneous action of the released mechanical means and the electrical means to close said passage.

8. A "flashback" stop having three chambers formed by transverse partitions, screens through which the gas passes on its way to the central chamber, primary and secondary stop-seats with battery and connections for magnetizing said seats, a stop adapted to seal against said primary seat, rod and piston attached to said stop, a cylinder within which said piston operates, a secondary stop with springs adapted to carry it into contact with the secondary seat, a series of hooks, thread so placed upon said hooks as to hold the secondary stop against the tension of the springs and the primary stop against displacement by gravity or violence, a switch adapted to short circuit said battery, when the thread to which it is attached is broken, and a receptacle for explosive opposite the outlet passage.

9. A "flashback" stop having three chambers formed by transverse partitions, by-passes for testing both the outlet and inlet ends thereof, screens through which the gas passes on its way to the central chamber, primary and secondary stop-seats with battery and connections for magnetizing said seats, a stop adapted to seal against said primary seat, rod and piston attached to said stop, a cylinder within which said piston operates, a secondary stop with springs adapted to carry it into contact with the secondary seat, a series of hooks, thread so placed upon said hooks as to hold the secondary stop against the tension of the springs and the primary stop against displacement by gravity or violence, a switch adapted to short-circuit said battery, when the thread to which it is attached is broken, and a receptacle for explosive opposite the outlet passage.

10. A "flashback" stop having three chambers formed by transverse partitions, by-passes for testing both the outlet and inlet ends thereof, screens through which the gas passes on its way to the central chamber, primary and secondary stop-seats with battery and connections for magnetizing said seats, a liquid seal connecting with the screen chamber, a stop adapted to seal against said primary seat, rod and piston attached to said stop, a cylinder within which said piston operates, a secondary stop with springs adapted to carry it into contact with the secondary seat, a series of hooks, thread so placed upon said hook as to hold the secondary stop against the tension of the springs and the primary stop against displacement by gravity or violence, a switch adapted to short-circuit said battery, when the thread to which it is attached is broken, and a receptacle for explosive opposite the outlet passage.

11. A "flashback" stop whose supply passage is normally open, screen partitions intermediate the inlet and outlet, explosives suitably disposed within the mechanism and mechanical means adapted to close said passage by explosives ignited by the "flashback."

12. A "flashback" stop whose supply passage is normally open, screen partitions intermediate the inlet and outlet, explosives suitably disposed within the mechanism and spring actuated stopping means adapted to be released by the explosives ignited by the "flashback".

13. A "flashback" stop whose inlet passage is normally open, screen partitions intermediate the inlet and outlet, explosives suitably disposed within the mechanism and a combination of inert and spring-actuated stopping means adapted to close the inlet passage through the agency of explosives ignited by the "flashback".

14. A "flashback" stop consisting of a liquid seal adapted to admit the combustible under predetermined pressure in combination with a mechanical gas passage closer, and screen partitions intermediate the inlet and outlet.

15. A "flashback" stop consisting of combined mechanical and electrical means for automatically closing the supply passage against the "flashback" and screen partitions intermediate the inlet and outlet.

16. A "flashback" stop whose inlet passage is normally open, a spring actuated means for closing this inlet passage, an outlet passage and non-metallic means, destructible by flame, for keeping the inlet open against the action of the springs, suitably disposed in reference to the outlet passage.

17. A "flashback" stop comprising among its members, an inlet and an outlet, a stop for closing said inlet, threads restraining said stop from closing said inlet, but exposed to flame flashing back through the outlet, and springs constantly tending to cause said stop to close the inlet.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

DANIEL O'KEEFE.

Witnesses:
THOS. J. BELL,
HARRY CURRIE SMITH,
EDWIN MCFARLAND.