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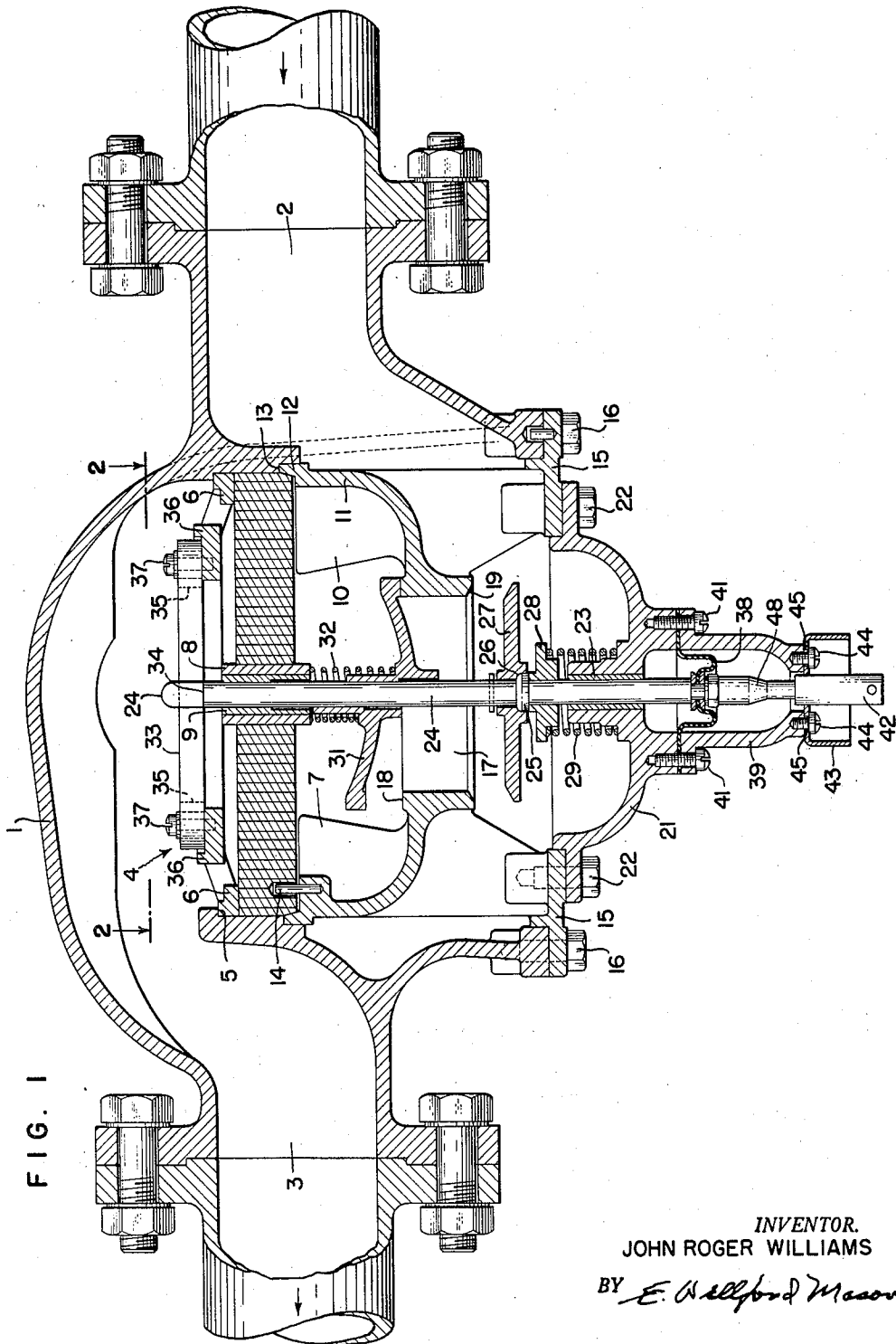
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2,913,320

FIRE CHECK

Filed Sept. 7, 1956

2 Sheets-Sheet 1



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FIG. 2

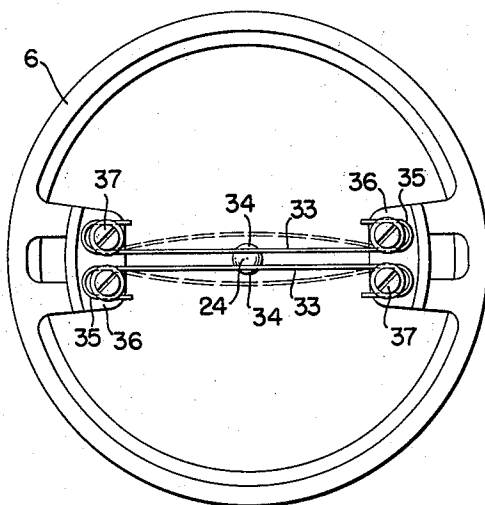
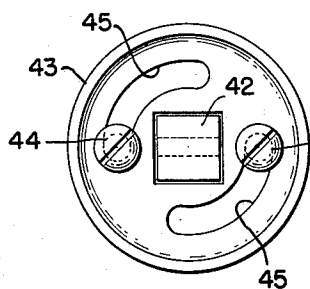
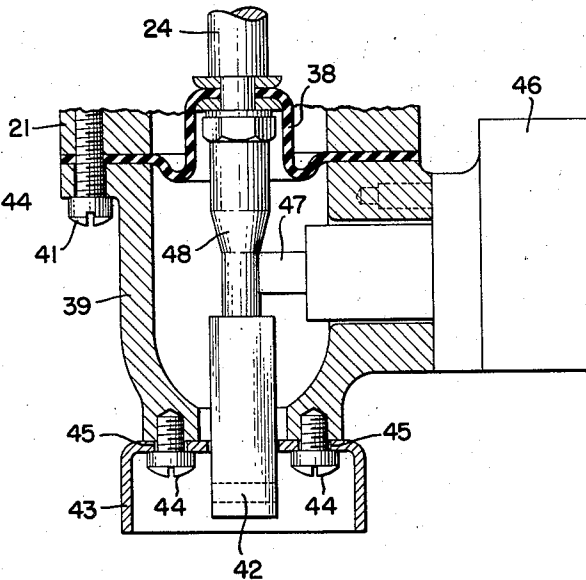


FIG. 4

FIG. 3



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2,913,320

FIRE CHECK

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6 Claims. (Cl. 48—192)

The present invention relates to safety apparatus, and more particularly to a device that is adapted to prevent a backfire from traveling upstream in a pipe or conduit through which an explosive mixture of gas and air is traveling. Devices of this type are commonly known as firechecks.

Devices of the type with which this invention is concerned are in wide use with industrial heating equipment, and one is shown, for example, in Hess Patent 2,332,380. The fire check shown in that patent, as well as others with which the applicant is familiar, have the disadvantage that they are difficult and costly to manufacture, assemble and adjust for operation. Many of them are also difficult to reset after a backfire has taken place.

It is an object of the invention to provide a firecheck which is inexpensive to manufacture, and which is easy to assemble. It is a further object of the invention to provide a firecheck in which all of the movable parts are aligned and move along a single axis. It is also an object of the invention to provide a fire check that is operative, without adjustment, when placed in any position in a fuel line.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a section through the apparatus,

Fig. 2 is a top view of a portion of the apparatus taken on line 2—2 of Fig. 1,

Fig. 3 is a bottom view of an adjusting member, and

Fig. 4 is a partial view of a portion of the apparatus showing a modification thereof.

The fire check of the invention is housed in a body formed of a casting 1 having an inlet 2 and an outlet 3 that are aligned with each other. The interior of the body is provided with a partition forming a passage 4 that is shown herein as being substantially perpendicular to the inlet and outlet. The various operative parts of the device are located in or are concentric with this passage.

The upper end of the partition forming passage 4 is undercut as shown at 5 to locate a retaining ring 6. A fire screen 7 is pressed against the other face of the ring. Screen 7 may be formed in any conventional way, but is preferably made of a strip of thin corrugated metal that is tightly wound around a spool 8. A fuel mixture can flow through the passages formed by the corrugations with only a small pressure drop. It is noted that a bushing 9 is located in the center of the spool.

Screen 7 is held in place, against ring 6, by a casting 11 whose upper end is received in passage 4. To this end the casting is provided with an upper wedge-shaped

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portion 12 that engages a shoulder 13 machined in the passage. It will be seen from an inspection of the drawing that the wedge-shape of the ring 12 forces the screen tightly into engagement with ring 6. A pin 14 may be provided in the casting 11 to extend between a pair of convolutions of the screen in order to prevent any possible rotation thereof. It is noted that casting 11 is provided with a plurality of inwardly extending ribs 10 that serve somewhat to support the screen and prevent it from telescoping. The casting 11 is provided around its lower edge with a radially extending flange by means of which it is fastened to casting 1 with bolts 16. When the bolts are threaded into place the casting and the parts associated with it will be rigidly fastened in the body 1.

Casting 11 is provided with a cylindrical passage 17 that is axially aligned with passage 4 in the body 1. The upper end of that portion of casting 11 forming passage 17 is machined to make a valve seat 18 while the lower edge of this portion is machined to make a second valve seat 19. The opening in the bottom of casting 11 is closed by means of a cap 21 which is fastened to the casting by suitable screws 22. This cap is provided with an opening receiving therein a bushing 23. A rod 24 which serves a number of purposes to be described below is guided for vertical reciprocating movement in bushings 9 and 23.

The lower end of rod 24 has a collar 25 on it, the upper surface of which is formed as a spherical seat 26. Resting loosely on this seat, and surrounding the rod, is a valve 27 that is adapted to engage valve seat 19 of casting 11. A pin extends through the rod above the valve to prevent the valve from falling into engagement with seat 19 if the device is used in an inverted position. Rod 24 is normally biased in an upwardly direction to move the valve 27 against the valve seat 19 by means of a spring 29 that extends between a ledge formed on the inner surface of cap 21 and a disc 28 that is fastened to the rod below collar 25. The arrangement just described permits a slight movement of valve 27 relative to rod 24 around seat 26 when the valve is closed. Thus any slight misalignment of the parts is compensated for, and the valve can close tightly.

Another valve 31, that serves as an automatic check valve, is slidably mounted on rod 24 between passage 17 and screen 7. A light spring 32 normally biases this valve toward seat 18 to close the passage, as shown by the right side of the valve. Valve 31 is made of a light material such as aluminum and, during operation of the device, is kept open by gas flowing through passage 17, as shown by the left side of the valve.

Rod 24 is held in its lower position with valve 27 open, as shown in Fig. 1 of the drawing, by means of a pair of bimetallic strips 33 that engage a pair of shoulders 34 formed adjacent to its upper end. The ends of the bimetallic strips 33 bent to U-shape as shown at 35 in Fig. 2 and they are supported on a pair of ledges 36 that extend inwardly from ring 6. The strips are held in position on the ledges by suitable cap screws 37.

The lower end of the device is sealed by means of a diaphragm 38 that is suitably held in a conventional manner on rod 24 with the outer edge of the diaphragm being fastened between the lower end of cap 21 and a cylindrical sleeve 39. Sleeve 39 is held in position by screws 41.

Rod 24 can be moved manually from its upper position in which valve 27 is closed to its lower position shown in the drawing by means of an extension 42 that is suitably threaded into the end of the rod. This extension is square for a purpose to be described below and passes through a suitable square opening in a cup 43 that is held against the lower end of sleeve 39 by screws 44. It is noted, as best shown in Fig. 3, that this cup is provided

with a pair of arcuate slots 45 through which the screws extend.

In the operation of the apparatus, with the parts in the position shown in Fig. 1, a combustible mixture of gas and air is supplied to the inlet 2. This mixture will pass through passage 17 of casting 11 and passage 4 of the body 1 to outlet 3. In the normal course of events, the flow of the fuel mixture will be unrestricted except by the small pressure drop which occurs as the mixture passes valve 31 and through the interstices of screen 7. If, however, there should be a backfire from the burners, or other apparatus that is being supplied with the combustible mixture, a pressure wave will travel back through the outlet into body 1 and through screen 7. This pressure wave will be greater than the normal pressure of the mixture and will therefore permit valve 31 to move downwardly along rod 24 and close off the supply of the fuel so that this pressure wave cannot be transmitted through the device to the source of supply.

Occasionally a backfire is accompanied by travel of the flame front back into body 1. When this takes place screen 7 will prevent travel of the flame front beyond this point. Even if the increased pressure resulting from the backfire is terminated, and valve 31 opens so gas can still flow through the screen, the gas will burn along the upper face thereof. As this burning takes place, the bimetallic strips 33 will be heated and will warp outwardly as shown by the dotted lines in Fig. 2, thereby moving the strips off shoulders 34 formed on rod 24. When the bimetallic strips have been heated sufficiently to free rod 24, spring 29 will force the rod upwardly, thereby closing valve 27 to cut off the supply of fuel. The valve will be retained in its closed position by spring 29 until such time as it is opened manually. After the cause of the backfire has been corrected and strips 33 have cooled enough to return to their full line position in Fig. 2, an attendant will grasp extension 42 and move it downwardly. Thereupon the bimetallic strips will snap over shoulders 34 to hold the rod in its lower position with valve 27 open, and the apparatus again will be in operative condition.

From time to time it may be desirable to test the apparatus, and also to move rod 24 to clear it of any dirt or the like which may have been deposited thereon by the fuel mixture flowing through the device. This can be accomplished by loosening screws 44, and rotating cup 43. When the cup has been rotated through substantially 90°, rod 24 will have been rotated to a position so that the shoulders 34 will no longer be effective to block movement of the rod. Rod 24 can be moved, when it is in this position, both manually and by spring 29 to test its operativeness. Rotating the cup back to the position shown in Fig. 3 of the drawing will return shoulders 34 to a position under the edges of bimetallic strips 33 and thereby again place the device in operative condition.

It will be seen from an inspection of the drawing that all of the operative parts of the device are concentrically located and are in a straight line. This construction makes the assembly of the device easily accomplished and also makes its manufacture easy because of the arrangement of the machined surfaces of the body and casting 11. The axial alignment of the various parts insures that the fuel mixture will travel through a minimum of restrictions as it is going from the inlet to the outlet of the device, and thereby reduce the pressure drop which is normally occasioned by the flow of such a gas.

For some applications it may be desirable to have an indication when a backfire has occurred which causes valve 27 to close. This can be accomplished by using movement of rod 24 to actuate an electric switch that is in an indicating circuit. To this end the cylindrical member 39, as shown in Fig. 4, can be modified to support an electric switch 46 of a standard type. This switch is provided with a plunger 47 that is actuated by a cam portion 48 formed on the extension 42 of rod 24. When

the rod moves upwardly due to heating of bimetallic strips 33, the rod will be moved from the position shown in Fig. 1 to that shown in Fig. 4. During this movement the plunger 47 of the switch will move to the left in Fig. 4 to actuate the switch. As extension 42 is moved downwardly in Fig. 4 to reset the device, plunger 47 will be moved to the right to reset the switch and the control circuit actuated thereby.

From the above it will be seen that I have invented an automatic fire check that is inexpensive to manufacture and is readily assembled. When repair or replacement of any of the parts is required, they can all be reached from a single location. The device can be placed in a straight pipe line with a minimum of inconvenience, and it is operative, without adjustment of the parts, when located in any position.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention as set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. A firecheck including a body having a straight passage through which a fuel mixture flows, said passage being provided along its length with a partition having formed thereon a pair of annular and opposed valve seats, a screen across said passage downstream of said valve seats, a rod extending axially of said passage through said screen and valve seats, a first valve being slidable on said rod between said partition and screen and being biased in one direction toward the one of said valve seats facing said screen and being adapted to be opened by flow of mixture through said passage, a second valve on said rod and movable therewith, means to bias said rod in the opposite direction to move said second valve against the other of said pair of valve seats, and temperature responsive means downstream of said screen to hold said rod in valve open position.

2. The combination of claim 1 in which said rod is provided with an enlargement having a substantially spherical bearing surface formed thereon and said second valve is provided with a seat engaging said surface whereby said second valve can be tilted relative to said rod as it engages said other valve seat.

3. A fire check comprising a body having an inlet and an outlet, partition means between said inlet and outlet having a passage therein with an axis and through which a fuel mixture flows and a pair of axially displaced valve seats, one on each side of said partition, concentric with said axis, a screen located across said passage downstream of said partition, a rod, means in said screen and said body to mount said rod for reciprocating movement along the axis of said passage, a first valve slidable on said rod between said partition and screen, means to bias said first valve in one direction toward closed position against said valve seat on the side of said partition toward said screen, said first valve being opened by flow of mixture through said passage, a second valve on said rod, means to bias said rod in the opposite direction to close said second valve against the other valve seat, and temperature responsive means to hold said rod in a position to maintain said second valve open.

4. In a fire check, a casing having an aligned inlet and outlet for a fuel mixture, means forming a passage in said body between said inlet and outlet at an angle thereto, a screen across said passage adjacent to the outlet end thereof, said passage being provided with means forming a pair of aligned valve seats upstream of said screen, a first valve aligned with said screen and adapted to engage the valve seat nearest said screen to close said passage, means biasing said first valve in a

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closed direction against the flow of mixture, a second valve aligned with said first valve and adapted to engage the other valve seat to close said passage, means biasing said second valve toward closed position, temperature responsive means across said passage downstream of said screen, and means controlled by said temperature responsive means to hold said second valve in open position.

5. In a firecheck, a body having an inlet and an outlet, said body being provided with a passage therein between said inlet and outlet, said passage having a shoulder extending radially inward around one edge thereof, a screen received in said passage and located by said shoulder, means received in said passage and abutting said screen and including a portion forming a partition between said inlet and outlet upstream of said screen, said portion being provided with an opening concentric with said passage, opposite edges of said opening forming valve seats, a rod concentric with said passage and said opening, a first valve between said screen and opening slidable on said rod adapted to engage the valve seat facing said screen and moved to open position by flow of gas from said inlet to said outlet through said opening, a second valve attached to said rod operable to engage said other valve seat, and means to bias said rod in a valve closing direction.

6. In a fire check, a hollow body provided with an axially aligned inlet and outlet, with a passage between the two having an axis at an angle to said inlet and outlet

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and an opening in said body aligned with said passage, said body having a flange extending radially inward around said passage at the end thereof remote from said opening, a screen placed in said passage through said opening and abutting said flange, partition means placed in said body through said opening and engaging said screen, said partition being provided with a passage therein aligned with the passage in said body, the passage in said partition being provided with a valve seat at each end thereof, a rod extending through said screen and said opening, a first valve between said screen and opening engaging the valve seat facing said screen and slidable on said rod, means to bias said valve to closed position, said valve being opened by a flow of gas through said passage, a second valve to engage the other valve seat fixed to said rod, means to bias said rod in valve closing direction, a cover for said opening, said cover having means therein to guide said rod, and means normally to hold said rod in a position in which said second valve is away from its valve seat.

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