

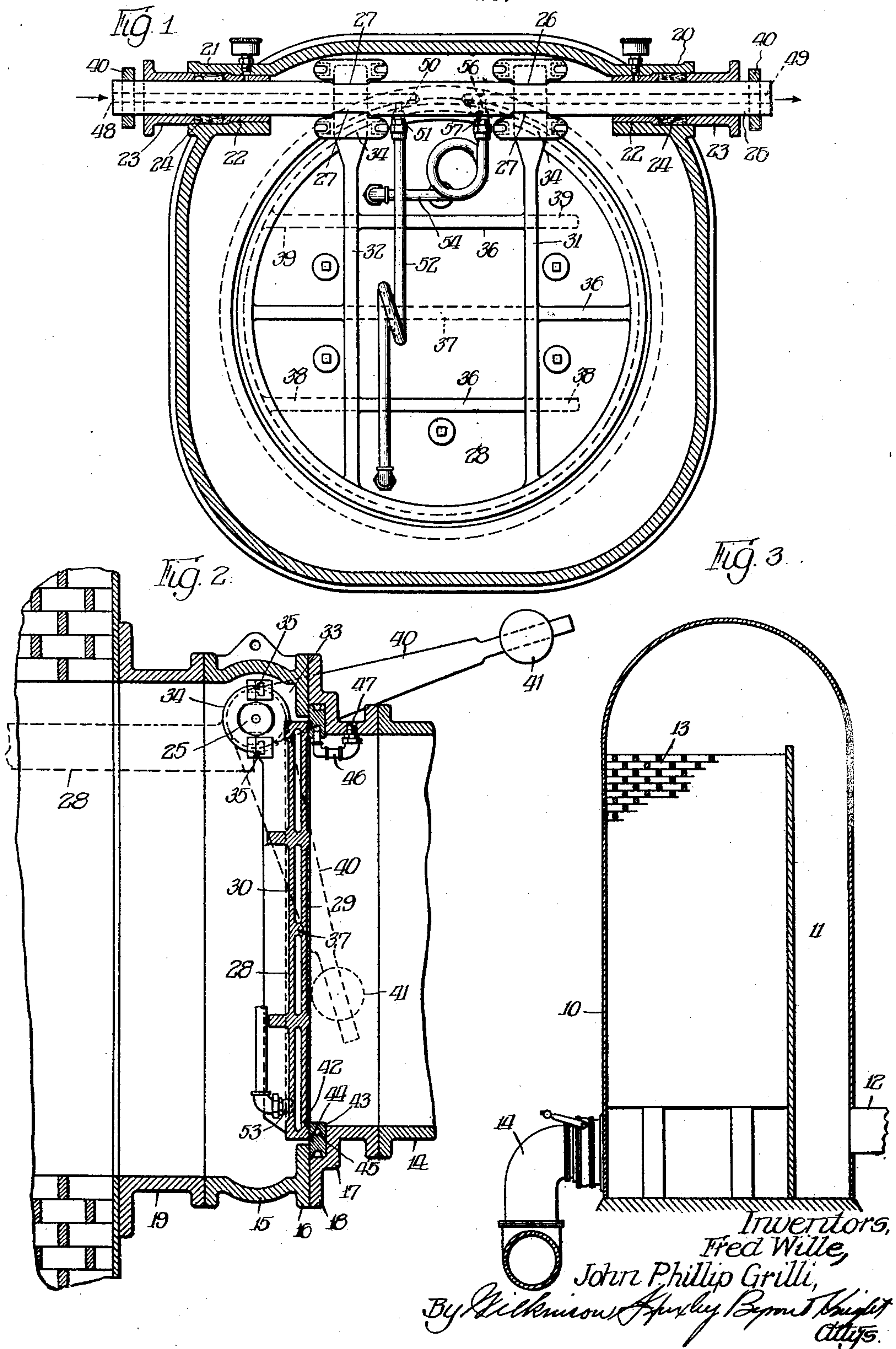
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CHIMNEY VALVE

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UNITED STATES PATENT OFFICE

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CHIMNEY VALVE

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Our invention relates to a chimney valve and has particular reference to a chimney valve used in connection with hot blast stoves for the heating of the blast conducted to the blast furnace, and has particular reference to a chimney valve which is automatic in operation in that it is so balanced that the valve is held in closed position by the pressure in the stove when the stove is on blast, and automatically opens so that the products of combustion can pass through the stove to the chimney when the stove is on gas.

Another and further object of our invention is the provision of a chimney valve which is adapted to seat closely and automatically, thereby preventing any loss of heat or loss of blast through this valve when the stove is on blast.

Another and further object of our invention is the provision of a chimney valve which is adapted to seat firmly against the valve seat due to a slight play between the axis upon which the valve is suspended and the mounting for the valve, so that the valve meets the valve seat in the proper plane even though the shaft from which the valve is suspended might be slightly out of alignment, or the casing slightly shifted.

Another and further object of our invention is the provision of a chimney valve which saves the time of the stove tender in changing the stove from gas to blast and also enables this change to be made quickly. Usually each stove has several chimney valves and if these are automatic the time of the stove tender in changing the stoves is thereby reduced.

Another and further object of our invention is the provision of a chimney valve having means for cooling the chimney valve and seat by flowing water therethrough.

These and other objects of our invention will be more fully and better understood by reference to the accompanying drawing, and in which—

Figure 1 is a view partially in elevation and partially in section of our improved chimney valve and the casing therefor;

Figure 2 is a longitudinal sectional view showing the valve in position in the outlet

pipe leading to the chimney of a hot blast stove; and

Figure 3 is a diagrammatic view showing the valve in position on a hot blast stove.

Referring now specifically to the drawing and in which like reference characters refer to like parts throughout, a stove 10 is shown having the usual combustion chamber 11 therein, with an inlet pipe 12, checkerwork 13, and an outlet pipe 14 leading to the chimney. Our invention has to do with the control of the products of combustion through the outlet pipe 14, and comprises a two-part casing consisting of one casing 15 having a flange 16 thereon and a second casing 17 having a flange 18 thereon which abuts against the flange 16 on the casing 15, these casings being secured together in any suitable manner. The casing 17 is joined to the pipe 14 at one end and a short pipe section 19 is provided which connects the member 15 with the stove 10.

Suitable hollow bearing retaining trunnions 20 and 21 are formed on the casing 15 within which bearings 22, 22 are mounted, with glands 23, 23 being provided, and suitable packing 24, 24 interposed between the gland members 23 and bearings 22. A shaft 25 is mounted in the trunnions 20 and 21 formed at the upper side of the casing 15 and extends across the casing at the upper portion thereof with its ends projecting out on each side of the casing 15. The shaft 25 is round in cross-sectional area with the exception of a pair of flattened portions 26, 26 at the upper side thereof and correspondingly flattened portions 27, 27 at the lower side of said shaft, the flattening of these portions of the shaft being shown particularly in Figure 2.

A valve member or flap 28 is shown which is round in shape and is formed with a pair of walls 29 and 30 suitably spaced from each other, with a pair of vertically extending ribs 31 and 32 formed on the wall portion 30 which have head portions 33, 33 formed on the upper ends thereof and which are adapted to fit partially around the shaft 25 with suitable cap members 34, 34 being provided which coact with the members 26 to encircle

the shaft 25 thereby suspending the valve flap 28 from the shaft 25. The head portions 33 have recesses 35, 35 within which bolt heads are seated which extend through the members 34 and hold them in position around the shaft 25. The heads 33 and valve caps 34 are flattened at their upper and lower inner sides to engage the flattened portions 26 and 27 respectively on the shaft 25, so as the shaft 25 is rotated the valve 28 is opened and closed. The openings in a longitudinal direction (when the valve is in closed position) are slightly larger than the horizontal diameter of the shaft 25 so that a slight amount of horizontal movement is allowed with respect to the valve flap 28 on the shaft 25. The purpose of allowing this movement is to enable the valve to seat properly if the valve and seat are slightly off a proper plane with respect to the shaft 25. The pressure of the blast against the valve 28 will cause it to seat properly on the valve seat and thereby prevent leakage.

A plurality of horizontally extending ribs 36 are provided on the back wall 30 of the valve 28 so that the valve is strengthened in a longitudinal direction. The members 29 and 30 are connected around their marginal edges and also at their central portions by a rib 37, and by a pair of ribs 38, 38 at the lower side outside of the vertically extending ribs 31 and 32 and at the upper portion by ribs 39, 39 which extend outwardly from the ribs 31 and 32. The purpose of these inside ribs is to direct a flow of water through the valve flap 28, as will be more fully described hereinafter.

Mounted upon the outer end of the shaft 25 is a pair of arms 40, 40 upon which counterweights 41 are placed at the upper ends thereof. These weights are adjustable with respect to the arms 40 and are so positioned that in the normal position of the arms 40 are adapted to open the valve flap 28 and retain it in open position. It will be noted that the valve flap 28 opens inwardly toward the stove 10 so when the stove is on blast the pressure of the blast in the stove overcomes the force of the counterweights 41 and the valve flap 28 is retained in closed position. When the blast is removed from the furnace and the pressure in the stove falls, the counterweights 41 automatically open the valve flap 28 so as to allow the products of combustion to pass into the chimney and away from the stove.

Around the marginal edge of the section 29 of the valve is a plurality of grooves or labyrinth surface 42 which is adapted to form a sealing means against the seat 43 which is mounted in the casing 17. The seat 43 is preferably made of copper or some other material of a similar hardness, with an extremely soft ring 44 of metal being embedded in the seat 43 and so positioned that

it is adapted to be engaged by the outer portion of the labyrinth seat on the section 29 of the valve. If dirt or other obstructions lodge against the seat, it will therefore not serve to hold the entire surface of the valve away, but will become embedded in the labyrinth grooves and the leakage through the valve will be very small. The soft metal rings 44 may be replaced when worn, if desired, thus effectually providing sealing means for the valve flap 28.

For purposes of cooling the valve flap and valve seat, a constant stream of water is kept flowing therethrough, the valve seat 43 having a circumferential channel 45 extending therearound with a pipe connection 46 being provided which extends into the casing 17 and terminates at 47 by means of which a water circulating pipe is secured to the pipe 46. A similar pipe connection is provided (not shown) which may be used either as an inlet or outlet pipe so that a constant flow of water is provided through the channel 45 in the seat 43.

The shaft 25 has a passage 48 formed therein which extends longitudinally of the shaft 25 but terminates short of the middle of the shaft 25. A second passage 49 is formed from the opposite end of the shaft 25 and extends longitudinally of the shaft and terminates at a point short of the center of the shaft 25. An opening 50 is tapped into the shaft 25 to connect with the passage 48, and a threaded nipple 51 is inserted into the shaft to which is connected a water pipe 52 which in turn leads to the lower section of the valve flap 28 and is connected through the wall 30 by means of a threaded nipple 53. A second pipe 54 is provided which is connected to the upper section of the valve flap 28 by means of a nipple and is also connected to the shaft 25 through an opening 56 within which a nipple 57 is inserted which in turn is connected to the outlet pipe 54. Water from any suitable source is forced in through the passage 48, pipe 52 into the lower section of the valve flap 28 where it circulates in the lower portion of the valve and passes upward to the rib 37, passes around each end of this rib and up into the upper section of the valve and out through the outlet pipe 54 and channel 49 in the shaft 25. Therefore a constant supply of water is kept circulating through the valve or flap 28 thus keeping it cool and in condition to prevent its warping out of alignment and also preserving the life of the valve.

The valve flap 28 is, of course, kept at substantially the same plane with respect to the shaft 25 so that the connections to the shaft 25 through the pipes 52 and 54 will not be broken loose. A supply of packing is placed around in the connections between the nipples 51 and 57 respectively so that a certain amount of flexibility is permissible between these joints to compensate for the slight

movement of the valve flap 28 with respect to the shaft 25.

In operation the valve is exceedingly simple in that it is automatic and does not require the attention of the stove tender, as is usual in the operation of chimney valves of this character which requires the services of the stove tender to open and close the valves with each change of operation of the stove. In our improved construction as soon as a stove is changed from blast to gas the valve opens automatically by reason of the reduction in pressure in the stove and vice versa when the stove is turned on blast and cut off of gas, the pressure which is built up in the stove will automatically cause the valve to close, thus shutting off the escape of the hot blast through the chimney valve, which in the operation of valves of the present type allows a very material heat loss to escape through the blast, resulting in waste.

While we have described more or less precisely the details of construction, we do not wish to be understood as limiting ourselves thereto, as we contemplate changes in form and the proportion of parts and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit or scope of our invention.

We claim:

1. A chimney valve for hot blast stoves comprising in combination a casing, a shaft extending therethrough, counterweights on said shaft, and a valve flap mounted on said shaft, the said flap being loosely connected to said shaft whereby a limited amount of horizontal movement is permitted between the said shaft and the said flap in closed position of the flap.

2. A chimney valve, comprising in combination a casing, a shaft having flattened portions thereon in said casing, a valve flap having ribs thereon having head portions at one side of said valve, adapted to engage the flattened portions of said shaft whereby the said valve is slidably movable on said shaft when in assembled position, bearing caps for said head portions, and a seat for said valve.

3. A chimney valve, comprising in combination a casing, a shaft having flattened portions thereon in said casing, a valve flap having ribs thereon having head portions at one side of said valve adapted to engage the flattened portions of said shaft, bearing caps for said head portions, and a seat for said valve, the said valve flap being movable on said shaft in a horizontal direction when the said flap is closed.

4. A chimney valve, comprising in combination a casing, a shaft having flattened portions thereon in said casing, a valve flap having ribs thereon having head portions at one side of said valve adapted to engage the flattened portions of said shaft, bearing caps for said head portion, and a seat for said valve,

the said head portions and said caps being in engagement with the said shaft on the flattened portions and out of engagement therewith on the rounded sides adjacent said flattened portions.

5. A chimney valve, comprising in combination a casing, a shaft having flattened portions thereon in said casing, a valve flap having ribs thereon having head portions at one side of said valve adapted to engage the flattened portions of said shaft, bearing caps for said head portion, and a seat for said valve, the opening formed by said caps and said heads being greater in one direction than in the other.

Signed at Chicago, Illinois, this 17 day of June, 1929.

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