April 9, 1963 T. L. GILBERTSON 3,084,683

EXPLOSION PREVENTING MEANS FOR COAL STOVES

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Fig. 1

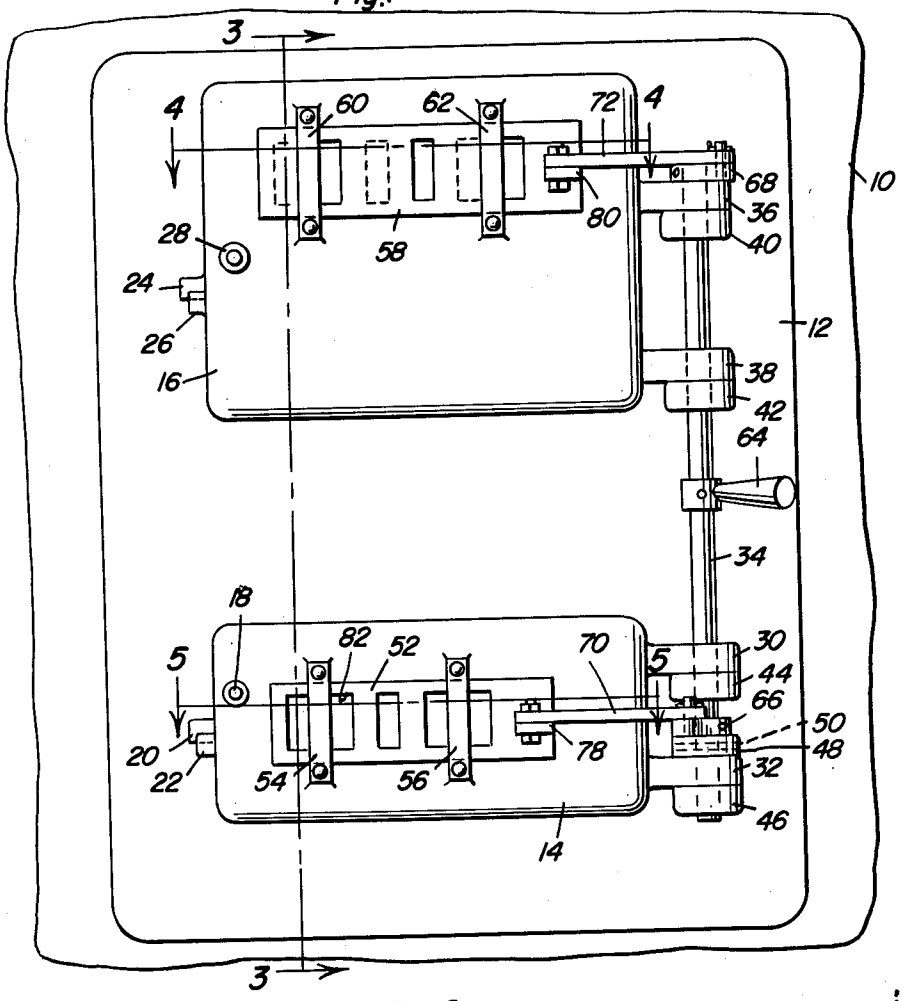
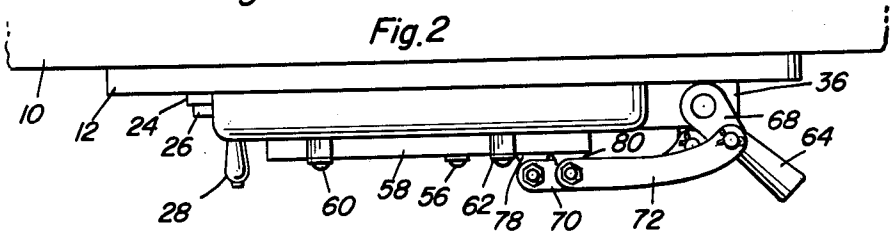


Fig. 2



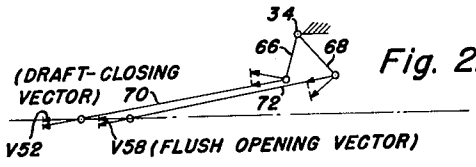


Fig. 2A

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Fig.3

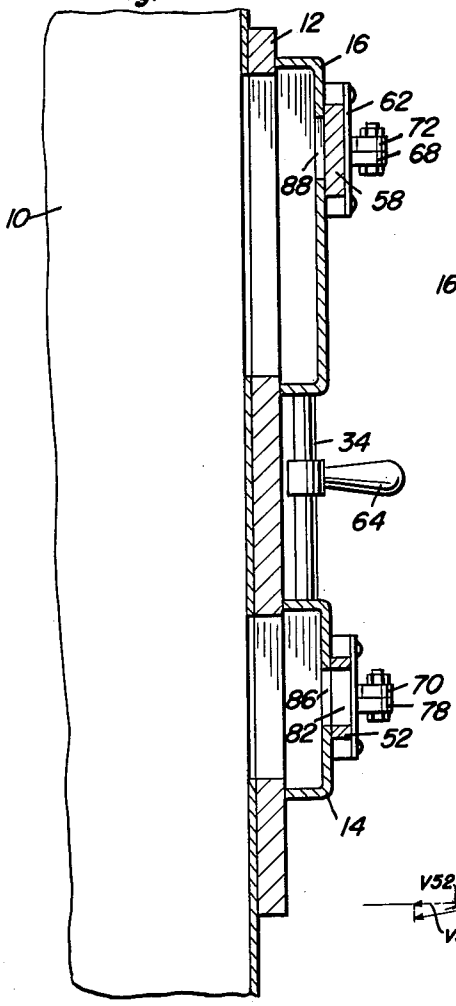
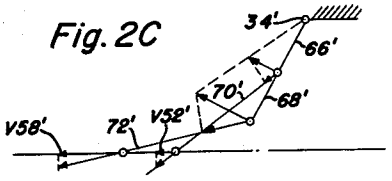


Fig. 2C



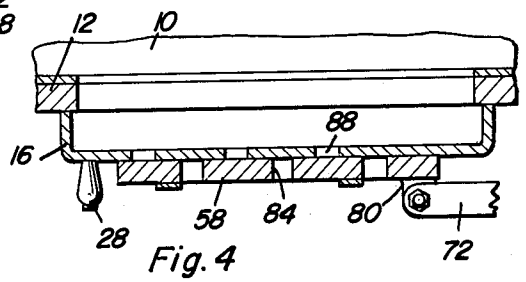
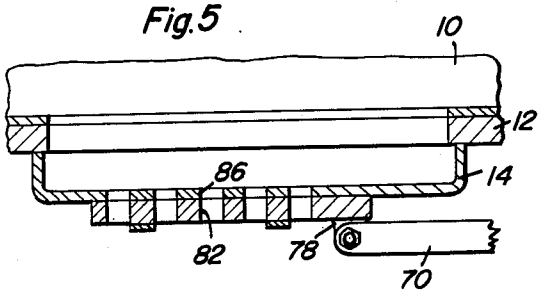


Fig. 4

Fig.5



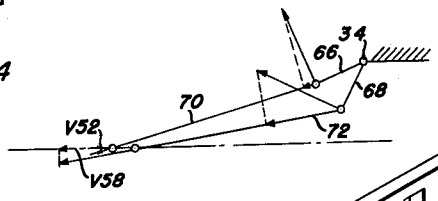


Fig. 2B

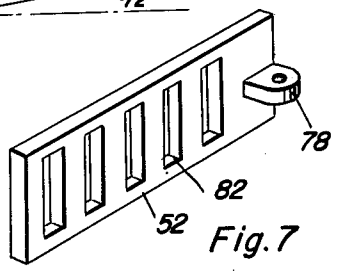
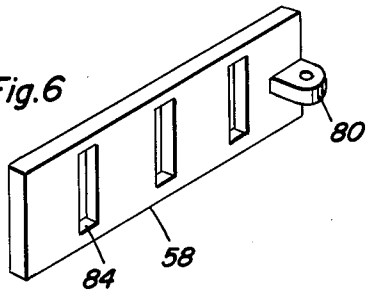


Fig. 7

Fig.6



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EXPLOSION PREVENTING MEANS FOR COAL STOVES

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8 Claims. (Cl. 126—290)

This invention relates to a mechanism for preventing coal stove explosions that often occur when the coal stove is shut down.

In the operation of coal stoves there is the constant danger of an explosion that often occurs when the stove is shut down. The explosion usually is the result of the accumulation of combustible gases within the combustion chamber occurring when the draft control air is shut off when shutting down the coal stove. Without the air draft in the coal stove, the accumulation occurs to cause the explosion. Accordingly, when shutting down the coal stove it is essential that the combustion chamber be open so as to permit air to enter thereinto in order to flush out any combustible gases that may remain within the combustible chamber after closing of the draft. It will therefore be appreciated that the danger of an explosion arises immediately upon closing of the draft supply of air and requires simultaneous opening of the combustion chamber. Otherwise, the slow mixing of air with the combustible gases may initiate the explosion. Therefore, the mechanism made in accordance with this invention not only insures that the combustion chamber is opened simultaneously with the closing of the draft supply of air beneath the combustion chamber but also rapidly opens the combustion chamber at the same time the draft openings are gradually and completely closed so as to avoid the aforementioned slow mixing of air.

It is therefore a primary object of this invention to provide a simple mechanism wherein gate valves are provided on the ashpit door and combustion chamber door of a coal stove which gate valves are simultaneously actuated from an open position of the draft valve and a closed position of the combustion flush valve to a closed position of the draft valve and an open position of the flush valve to thereby prevent an explosion when the coal stove is shut down. Another object of this invention is to provide actuating mechanism for simultaneous actuation of the draft valve and flush valve which further insures prevention of an explosion by causing rapid opening of the flush valve simultaneous with gradual closing of the draft valve during final displacement of the actuating mechanism.

An additional object of this invention in accordance with the preceding object is therefore to provide an actuating control mechanism for simultaneous control of the draft valve and flush valve having an initial range of travel during which the draft valve may control the amount of draft without being effective to open the flush valve. The actuating mechanism accordingly does not disturb the normal operation of the draft control when it is not desired to shut down the stove.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is an elevational view of a part of the coal stove body to which the mechanism of this invention is applied.

FIGURE 2 is a top plan view of the mechanism illustrated in FIGURE 1.

FIGURES 2A and 2B are vector diagrams illustrating

the variations in speed imparted to the valve elements through the actuating mechanism of the present invention.

FIGURE 2C is a vector diagram associated with an alternate form of valve actuating mechanism.

FIGURE 3 is a sectional view taken through a plane indicated by section line 3—3 in FIGURE 1.

FIGURE 4 is a sectional view taken through a plane indicated by section line 4—4 in FIGURE 1.

FIGURE 5 is a sectional view taken through a plane indicated by section line 5—5 of FIGURE 1.

FIGURE 6 is a perspective view of the flush valve element.

FIGURE 7 is a perspective view of the draft valve element.

Referring now to the drawings in detail, it will be observed in FIGURE 1 that the mechanism made in accordance with this invention is applied to the body of a coal stove generally designated by reference numeral **10**. Mounted on the coal stove body **10** therefore is a plate **12** which extends between the combustion chamber and the ashpit of the coal stove. Accordingly, the plate **12** at its lower end mounts an ashpit door **14** while at its upper end it mounts a combustion chamber door **16**. It will therefore be apparent that door **14** may be opened for removal of ashes below the grate of the coal stove above which the combustion chamber is located. It will also be apparent that the door **16** may be opened for inspection of the combustion chamber. Accordingly, the door **14** includes a handle **18** and a lug **20** which cooperates with a projection **22** on the plate **12** for holding the door **14** in closed position. Similarly, the door **16** includes a lug **24** cooperating with a projection **26** on the plate **12** to retain the door **16** closed. The door **16** also has a handle **28**. The door **14** is therefore hingedly mounted on the plate **12** by means of a pair of projecting apertured lugs **30** and **32** on the door **14** through which a control shaft **34** extends. Also, the door **16** includes a pair of apertured lugs **36** and **38** through which the control shaft **34** extends. The control shaft is accordingly rotatably mounted on the plate **12** by projecting pivot supports **40**, **42**, **44** and **46**. The control shaft **34** is therefore retained against axial disassembly by means of thrust washer **48** secured to the shaft by a pin **50**.

It will be observed in FIGURE 1, that the ashpit door **14** has slidably mounted thereon a draft gate valve element **52**, the door **14** being accordingly provided with guide members **54** and **56** attached thereto in any suitable manner in order to slidably receive the gate valve **52** for sliding movement thereof over the face of the door **14**. The door **16** is similarly provided with a flush control gate valve **58** slidably mounted on the base of the door **16**, by means of guide members **60** and **62**. The valve elements **52** and **58** are accordingly simultaneously actuated by means of the control shaft **34**.

Referring therefore to FIGURES 1 and 2 in particular, it will be observed that the control shaft **34** has an actuating handle **64** fixed thereto intermediate the ends of the control shaft **34** while crank members **66** and **68** are connected to the control shaft **34** adjacent its upper and lower ends. The respective crank members **66** and **68** are then operatively connected to the gate valve elements **52** and **58** connecting link members **70** and **72**. Suitable pivot connections are accordingly provided between the link members and the crank members such as pivot pin **74** and cotter pin **76** as more clearly seen in FIGURE 2. The link members **70** and **72** are also suitably pivotally connected to the valve element **52** and **58** by means of projecting pivot lugs **78** and **80** on the valve elements **52** and **58** respectively.

Referring therefore to FIGURES 6 and 7 in particular, it will be observed that the draft valve element **52** in-

cludes a plurality of rectangular draft openings 82 while the flush control valve element 58 includes a plurality of similar flush openings 84. It will however be observed that the openings 84 in the valve element 58 are more widely spaced apart than the openings 82 in the valve element 52. Referring therefore to FIGURES 4 and 5 in particular, it will be observed that the draft control valve element 52 when in its open position illustrated in FIGURE 5 has all of its openings 82 in registry with rectangular draft ports 86 on the face of the ashpit door 14. Accordingly, in the completely open position illustrated, the draft control valve element 52 will admit a maximum draft flow of air through the coal stove for maximum controlled combustion. Referring also to FIGURE 4 it will be observed that for the same open position of the draft control element 52 the flush control valve element 58 occupies a completely closed position wherein the openings 84 in the valve element are out of registry and spaced from rectangular draft ports 88 in the face of the combustion chamber door 16. Accordingly, it will be apparent that the openings 86 in the ashpit door 14 may be reduced in size by movement of the valve element 52 toward the left as viewed in FIGURE 5 while simultaneous leftward movement of the valve element 58 up to a certain extent will not open the ports 88 in the combustion door 16 to the atmosphere. Accordingly, within a certain range of movement imparted to both the draft control valve 52 and flush valve 58 by angular displacement of the control shaft 34, the draft ports 86 may be controlled without admitting any air into the combustion chamber through the ports 88 in order to vary controlled combustion. However, when the control handle 64 and control shaft 34 are angularly displaced in excess of the amount hereinabove indicated, the valve element 52 will approach a closing position so as to shut off the ports 86 from communication with the atmosphere and at the same time begin to open the ports 88 for admitting flushing air into the combustion chamber.

Accordingly, the crank members 66 and 68 are so disposed on the control shaft 34 so that simultaneous angular displacement of the crank members 66 and 68 effecting simultaneous slidable movement of the valve elements 52 and 58 will initially move the valve element 52 at a high linear rate of speed as indicated by velocity vector V52 in FIGURE 2A as compared to the speed of valve element 58 as denoted by velocity vector V58, while during final displacement of the valve element toward its closed position, it will be moved at a lower linear rate of speed as indicated in FIGURE 2B. Also, the crank members are so disposed that during the final displacement of the valve elements 52 and 58, the valve element 58 will be moved at a higher linear rate of speed as compared to the displacement speed of the valve element 52. Accordingly, the air through the combustion chamber may be rapidly admitted through flush ports 88 while at the same time the draft ports 86 are gradually and completely closed. An explosion is accordingly prevented with utmost assurance.

As illustrated in FIGURES 1 and 2 it will be observed that the crank members 66 and 68 are angularly spaced from each other on the control shaft 34 so that in the illustrated position wherein the handle 64 is to the right, initial movement of the handle and crank members 66 and 68 would impart relative slow movement to the valve element 58 and more rapid movement to the valve element 52. Also, it will be apparent that during the final displacement of the control handle 64 toward the left, handle 64 will be substantially displaced by ninety degrees so that it is then moving the valve element 58 at a high rate of speed as compared to the valve element 52 being moved at a lower rate of speed inasmuch as the crank member 66 connected thereto has been displaced approximately ninety degrees from the position illustrated in FIGURE 2. The drawings illustrate the crank members 66 and 68 angularly spaced from each other on the shaft 34. It should be realized that the angular spacing may be varied anywhere between zero and ninety degrees. It will therefore be apparent that the crank member 68' must necessarily be longer than the crank members 66' so as to insure more rapid movement of the valve element 58 under all conditions when the crank members 66' and 68' are angularly aligned with each other on the control shaft 34 as indicated in FIGURE 2C. Also, the direction of movement may be reversed if so desired so that the control handle 64 is moved from the left toward the right in order to displace the draft control valve element 52 from its completely open position to its completely closed position.

From the foregoing description, operation and utility of the mechanism made in accordance with this invention will be apparent. It will therefore be appreciated that the control mechanism is readily adaptable to conventional coal stove constructions and prevents coal stove explosions with an unexpected degree of reliability.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. In a coal stove having an ashpit door, and a combustion chamber door, the combination of, a draft controlling valve means movably mounted on the ashpit door and having a controllable flow area, flush valve means movably mounted on the combustion chamber door and having a controllable flow area for admitting air to the combustion chamber to flush out combustible gas accumulations resulting from closing of the draft controlling valve means in shutting down the coal stove and valve actuating means operatively interconnecting the draft valve means and flush valve means in spaced valve positions to reduce the flow area of the draft valve means with a linear closing speed which is slower than the linear opening speed of the flush valve means during increase in the flow area thereof simultaneously with said reduction of the flow area of the draft valve means at a slower rate to thereby prevent coal stove explosions.

2. In a coal stove having an ashpit door, and a combustion chamber door, the combination of, a draft controlling valve means movably mounted on the ashpit door, flush valve means movably mounted on the combustion chamber door for admitting air to the combustion chamber to flush out combustible gas accumulations resulting from closing of the draft controlling valve means in shutting down the coal stove, and valve actuating means operatively interconnecting the draft valve means and flush valve means in spaced valve positions to close the draft valve means with a rate of closing which is slower than the rate of opening of the flush valve means during opening thereof simultaneously with closing of the draft valve means to thereby prevent coal stove explosions, said valve actuating means being operative in one range of travel to controllably reduce the opening of the draft valve means at a relatively rapid rate of movement before opening the flush valve means while in a second range of travel the slower rate of closing of the draft valve means and more rapid rate of opening of the flush valve means occurs.

3. The combination as defined in claim 1, wherein said actuating means comprises a manually actuatable control shaft, a pair of cranks connected to said shaft, and a pair of link members connecting the respective cranks to the draft valve means and flush valve means, said cranks being positioned on the control shaft so as to displace the draft valve means from its open position initially at a high linear speed and finally at a lower linear speed to-

ward closing position upon angular displacement of the control shaft between its limit positions.

4. In a coal stove having an ashpit door, and a combustion chamber door, the combination of, a draft controlling valve means movably mounted on the ashpit door, flush valve means movably mounted on the combustion chamber door for admitting air to the combustion chamber to flush out combustible gas accumulations resulting from closing of the draft controlling valve means in shutting down the coal stove, and valve actuating means operatively interconnecting the draft valve means and flush valve means in spaced valve positions to close the draft valve means with a rate of closing which is slower than the rate of opening of the flush valve means during opening thereof simultaneously with closing of the draft valve means to thereby prevent coal stove explosions, said actuating means comprising a manually actuatable control shaft, a pair of cranks connected to said shaft, and a pair of link members connecting the respective cranks to the draft valve means and flush valve means, said cranks being positioned on the control shaft so as to displace the draft valve means from its open position initially at a high rate of speed and finally at a lower rate of speed toward closing position upon angular displacement of the control shaft between the limit positions, said flush valve means not being effective to admit any flushing air to the combustion chamber during initial displacement thereof by the actuating means.

5. The combination as defined in claim 4, wherein one of said cranks is angularly spaced from the other crank on the control shaft for more rapidly opening the flush valve means during final displacement thereof by the actuating means.

6. The combination as defined in claim 1, wherein said actuating means comprises a manually actuatable control shaft, a pair of cranks connected to said shaft, and a pair of link members connecting the respective cranks to the draft, valve means and flush valve means, said cranks being positioned on the control shaft so as to displace the draft valve means from its open position initially at a high rate of speed and finally at a lower rate of speed toward

closing position upon angular displacement of the control shaft between its limit positions, one of said cranks being angularly spaced from the other crank on the control shaft for more rapidly opening the flush valve means during final displacement thereof by the actuating means.

7. In a coal stove having an ashpit door, and a combustion chamber door, the combination of, a draft controlling valve means movably mounted on the ashpit door, flush valve means movably mounted on the combustion chamber door for admitting air to the combustion chamber to flush out combustible gas accumulations resulting from closing of the draft controlling valve means in shutting down the coal stove, and valve actuating means operatively interconnecting the draft valve means and flush valve means in spaced valve positions to close the draft valve means with a rate of closing which is slower than the rate of opening of the flush valve means during opening thereof simultaneously with closing of the draft valve means to thereby prevent coal stove explosions, said flush valve means being not effective to admit any flushing air to the combustion chamber during initial displacement thereof by the actuating means.

8. The combination as defined in claim 1, wherein said actuating means comprises a manually actuatable control shaft, a pair of cranks connected to said shaft, and a pair of link members connecting the respective cranks to the draft valve means and flush valve means, said cranks being positioned on the control shaft so as to displace the draft valve means from its opening position initially at a high rate of speed and finally at a lower rate of speed toward closing position upon angular displacement of the control shaft between its limit positions, one of said cranks being longer than the other so as to displace the flush valve means at a faster speed than the draft valve means during final displacements thereof by the actuating means.

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