

[54] VALVE APPARATUS

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[51] Int. Cl. F16k 43/00

[58] Field of Search 137/315, 327, 328, 329, 329.01, 137/329.06, 612.1; 251/318; 263/10; 266/17, 24, 31

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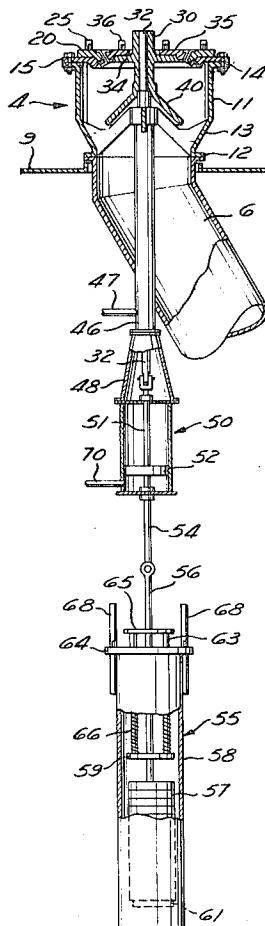
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[57]

ABSTRACT

Bleeder valve apparatus for blast furnaces are disclosed in which valve parts subject to wear or erosion by abrasive-laden gas are readily accessible from the top of the apparatus for replacement or repair, without the necessity of removing supporting levers or other parts that impair access from the top. The valve members are supported and actuated from below to leave the tops of the valve members accessible. The valve apparatus, which may be either of the outer opening type or inner opening type, also comprises a movable valve member having two seats and a cooperating stationary member or body having two seats, one of the seats of each member being a primary seat that can be removed for repair or replacement. When the primary seats are removed, the remaining seats of the members can engage to prevent flow of gas out of the valve.

20 Claims, 13 Drawing Figures



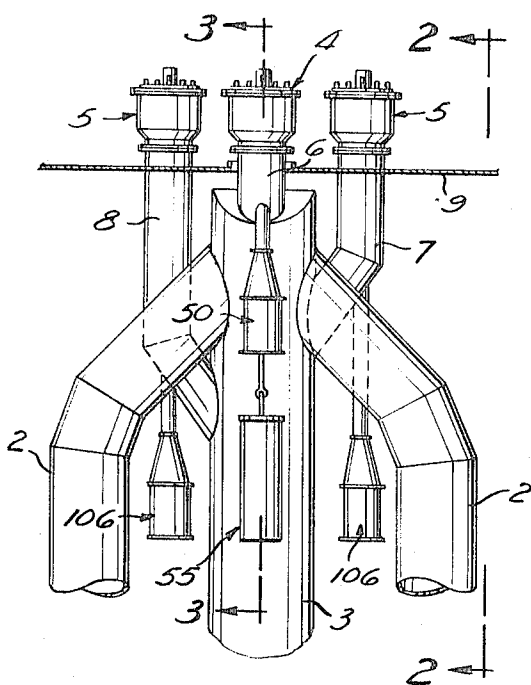


Fig. 1

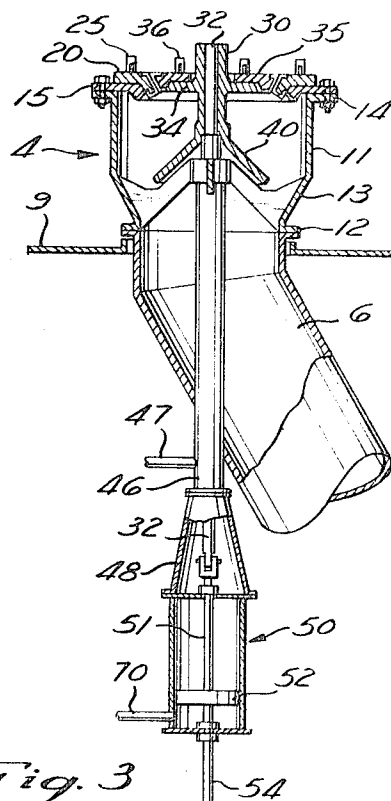


Fig. 3

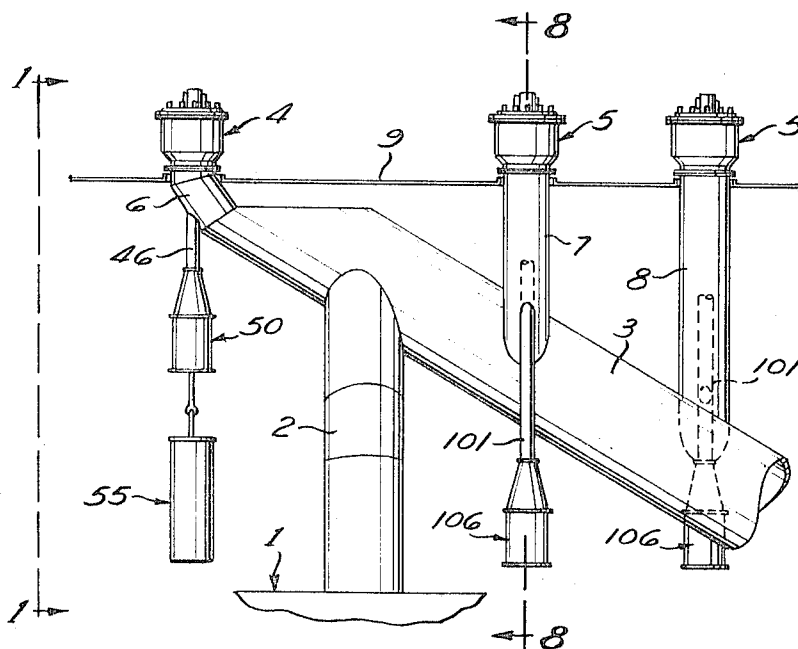
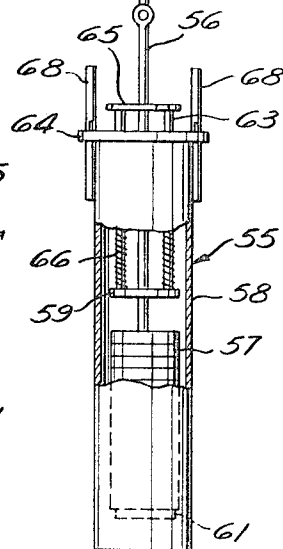


Fig. 2



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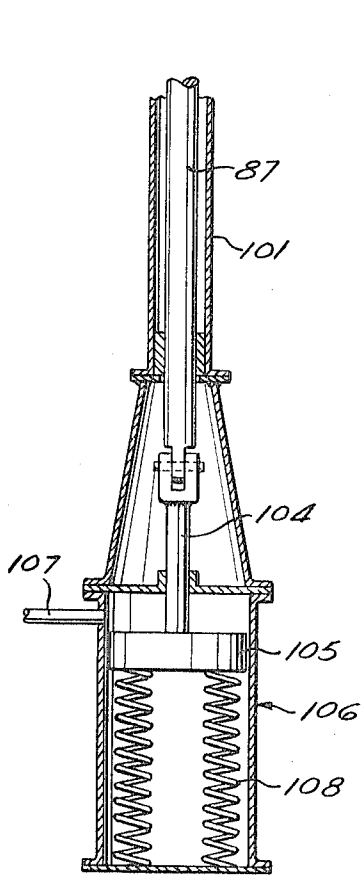


Fig. 11

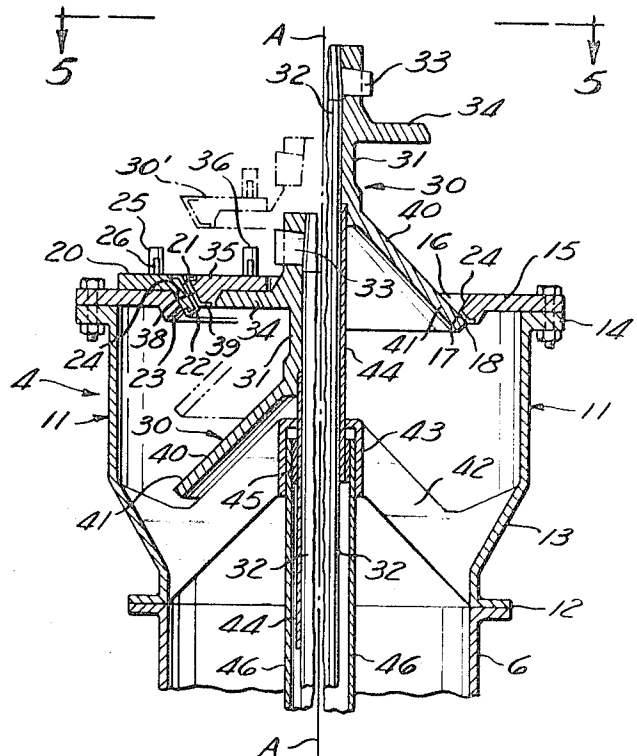


Fig. 4

Fig. 4A

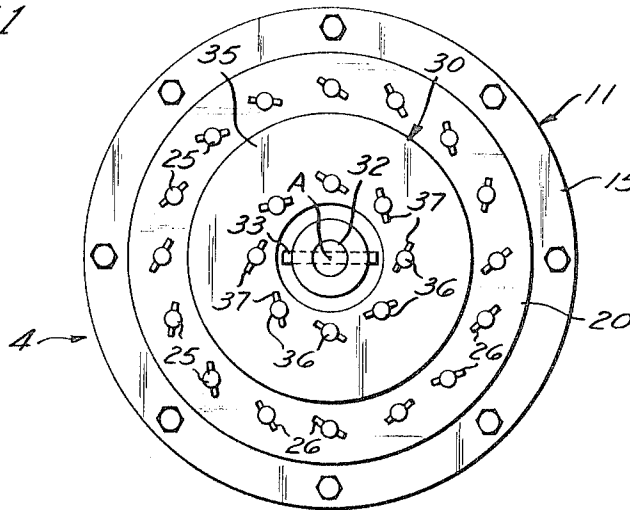


Fig. 5

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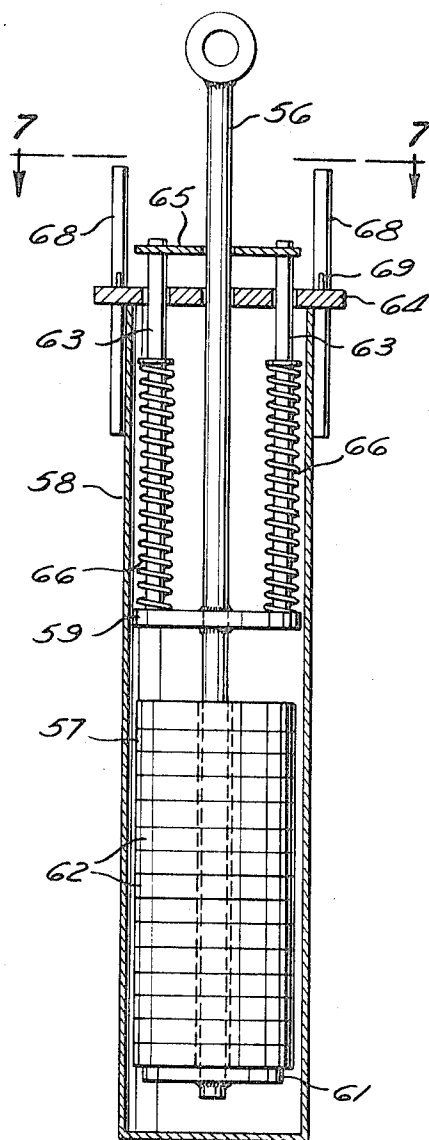


Fig. 6

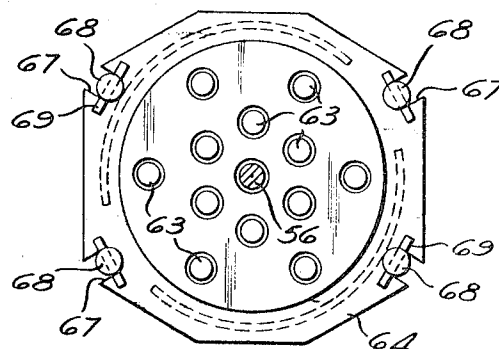


Fig. 7

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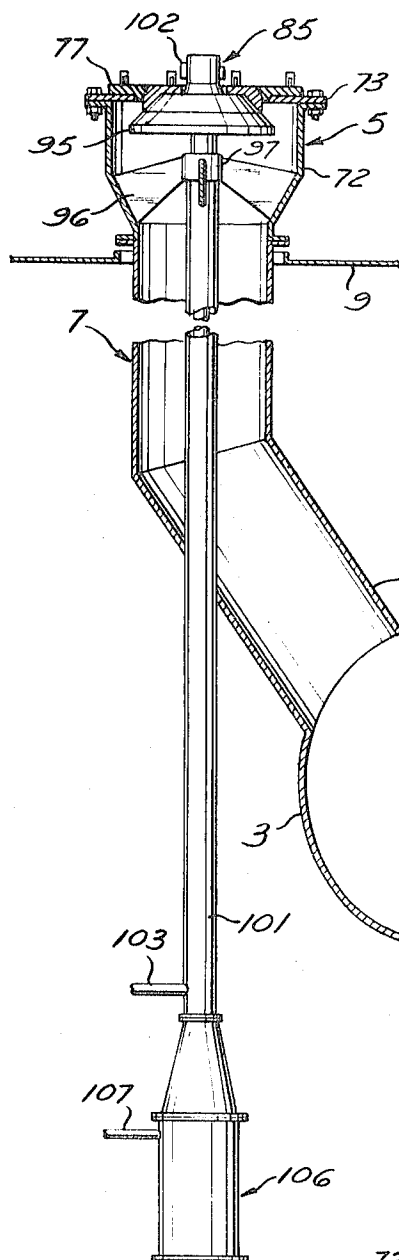


Fig. 8

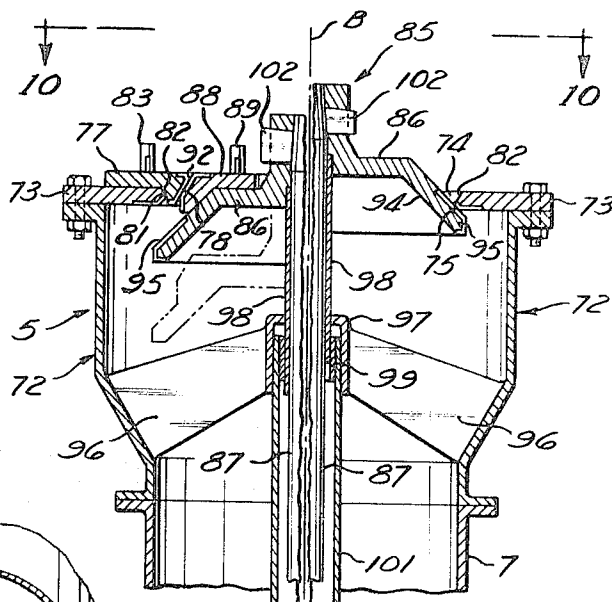


Fig. 9

Fig. 9A

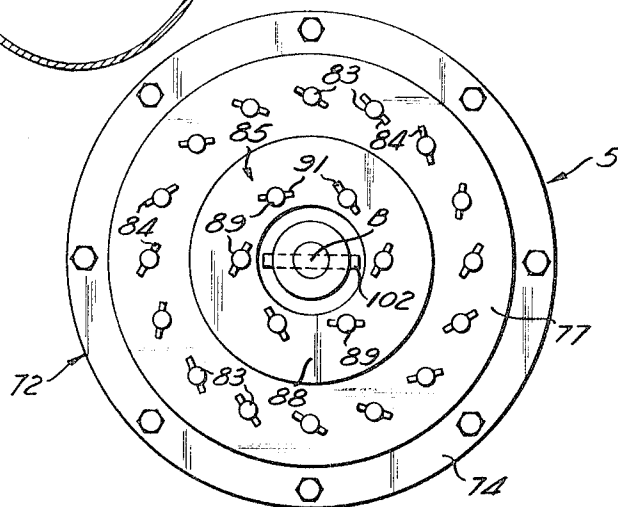


Fig. 10

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VALVE APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to valve apparatus and, more particularly, to valve apparatus such as a bleeder valve for a blast furnace in which wearable valve parts are readily accessible to workmen and can be repaired or replaced without shutting off the valve or removing it from service.

For convenience, valve apparatus embodying the invention is described as a bleeder valve for a blast furnace, although the valve apparatus may be used for other applications.

The top of a blast furnace for producing iron usually has a number of uptakes that receive hot gases from the furnace and are connected to a downcomer for carrying away the furnace gases. Bleeder valves are installed at the blast furnace top; usually on the uptakes, to relieve pressures inside the furnace.

Blast furnace valves are of two general types. One type is an outer opening valve having a movable closure member that is held downward against a stationary valve seat and against the pressure of gas in the furnace, usually by a counterweight. This valve acts as a safety valve in the event excessive pressures develop in the furnace. A second type of bleeder valve comprises an inner opening valve having a movable closure member that is held upwardly against a stationary valve seat by the pressure of gas in the furnace, and is intentionally moved away from its seat when it is desired to reduce gas pressure in the furnace.

Parts of conventional bleeder valves such as seats exposed to escaping furnace gases have relatively short lives, even though they are made of or surfaced with wear-resistant metals or other materials. The furnace gases are not only at high temperatures but contain substantial quantities of finely divided highly abrasive solids, usually comprising charge materials. When a bleeder valve opens, the rush of abrasive-laden gases out of the valve erodes and scores the valve seats and parts of the bleeder valve, often resulting in substantial gas leakage when the valve is closed. Once a valve begins to leak, the abrasive-laden leaking gases continue to score the valve seats, increasing the leakage.

As a result, it is necessary to replace the valve seats and other work parts frequently. This adds substantially to the costs of operating a blast furnace. Normally, a conventional bleeder valve can be repaired or replaced only when the blast is taken off the furnace; since considerable time is required to repair conventional valves, the production from the furnace is materially reduced.

In a conventional outer opening bleeder valve, a movable valve member is supported and operated from the top of the valve by a lever pivoted between a connection to such valve member and an actuating cable, so the weight of the movable valve member and a counterweight are on the same side of the pivot. In this manner, the weight of the counter weight and the movable member normally hold the movable valve member closed against a stationary seat on the valve body. When excessive gas pressure develops, the movable valve member is lifted by the gas against the force exerted by the counterweight. If desired, the valve can also be intentionally actuated as by a cable attached to the opposite end of the lever.

In a conventional inner opening bleeder valve the movable member of the valve is supported and operated from the top of the valve by a lever pivoted between a connection to such valve member and a counterweight, so that the counterweight tends to urge the movable valve member upwardly and hold it against a stationary seat on the valve body. The valve may be intentionally opened by a cable at the other end of the lever.

It is conventional practice to provide replaceable seats of hard metal on both the movable and stationary members of each type of valve to reduce erosion and attendant problems. The designs of bleeder valves previously used have made it a difficult and time-consuming job to replace such valve seats. Removal and replacement usually require several hours. Moreover, because of continuing gas leakage once a valve has been opened, it is often necessary to repair or replace the seats after even a single opening of at least outer opening valves.

In order to replace the valve seats in each type of valve, it is necessary to disconnect and remove the lever at the top of the valve and other parts that support the movable valve member in order to provide access to the valve seats and permit upward removal of the seats; moreover, it is necessary to support the movable valve member by special braces, blocking or other means as and after the lever is removed and while the valve seats are being repaired or replaced. All this is complicated, time-consuming, laborious and often hazardous, particularly since there are several of these valves on each furnace and since operations of the furnace must be halted while repairs are in progress.

SUMMARY OF THE INVENTION

In valve apparatus embodying the invention, the movable valve member is not supported and actuated from above, but is supported and actuated from below, so removable valve seats can be readily repaired or replaced from above without the necessity of removing supporting levers or other upper parts. Preferably the movable valve member has two seats, and the stationary member or body of the valve has two seats. One seat on each valve member has a primary detachable seat, these seats normally contacting to close the valve. The other seat portions of the valve members provide secondary or auxiliary seats that engage when it is desired to expose the primary seats for repair or replacement while still preventing flow of gas through the valve.

According to the invention, several valves may be mounted on a single conduit, such as a downcomer, for economies in construction and simplicity of operation.

Preferably an actuating rod carries the movable valve member and is actuated from below and outside of a conduit in which the valve apparatus is installed. The area above and about the valve apparatus is open for easy access. Valve seats are detachably secured to the movable and stationary valve members so that removal of the seat from one of the members exposes the seat on the other member for removal, and makes possible contact of the secondary seats of both members when the movable valve member is lifted. Moreover, in this lifted position, the movable valve member is at a location easily accessible for replacement of any worn part on it.

The valve may be either of the outer opening or inner opening type. In the first type, the movable valve member is connected to counterweight means below the member to bias the movable valve member downward to the closed position. In the second type, the movable valve member is biased upward from below and is connected from below to a fluid actuated cylinder that moves the movable valve member down when desired to open the valve.

Means may be provided to introduce steam or other clean gas under pressure around a valve-actuating rod so that leaks of dirty blast furnace gas outwardly along the rod are prevented.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a fragmentary end view of a downcomer at the top of a blast furnace carrying bleeder valves of the present invention, generally from line 1—1 of FIG. 2.

FIG. 2 is a side elevation of FIG. 1, showing several valves on a downcomer, the valve to the left being an outer opening valve and the others being inner opening valves embodying the invention;

FIG. 3 is a section along line 3—3 of FIG. 1, to a larger scale, of the outer opening valve apparatus of FIGS. 1 and 2, and also illustrates actuating means extending through an offset section of a conduit in which the valve apparatus is installed;

FIGS. 4 and 4A are enlarged, cross-sectional views of the outer opening valve of FIG. 3, FIG. 4 illustrating the valve members in normal closed position and FIG. 4A illustrating the valve members when one valve seat of each of the movable and stationary valve members is removed and the movable

valve member is in an upper position where the secondary seats engage;

FIG. 5 is a plan view of FIG. 4 along line 5—5;

FIG. 6 is an enlarged, longitudinal cross section of the counterweight means of FIG. 3;

FIG. 7 is a section of FIG. 6 on the line 7—7;

FIG. 8 is a section along line 8—8 of FIG. 2, to a larger scale, of one of the inner opening valves of FIGS. 1 and 2, embodying actuating means extending through an offset section of a conduit in which the valve apparatus is installed;

FIGS. 9 and 9A are enlarged, cross sectional views of the inner opening valve of FIG. 8, FIG. 9 illustrating the valve members in closed position with the primary seats in contact, and FIG. 9A illustrating the valve members when one valve seat of each of the movable and stationary valve members is removed and the movable valve seat is lifted so the secondary seats contact;

FIG. 10 is a plan view of FIG. 9;

FIG. 11 is an enlarged, longitudinal cross section of the actuating means of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 illustrate the top portion of a blast furnace 1 having uptakes 2 connected to a downcomer 3. The downcomer conducts blast furnace gases from the uptakes to further apparatus such as a solids separator and gas washer. In the embodiment illustrated, downcomer 3 has bleeder valves 4, 5, which are either manually or automatically operated for the purpose of relieving pressures within the furnace. The illustrated bleeder valves include an outer opening valve 4 shown installed in a conduit 6 opening into downcomer 3, and two identical inner opening valves 5, respectively installed in conduits 7, 8 opening into downcomer 3. An access platform 9 extending around the conduits 6, 7, 8 enable workmen to reach the valves.

In the illustrated outer opening valve 4 as shown in FIGS. 3, 4, 4A, 5, 6 and 7 conduit 6 and a hollow stationary valve member or body 11 are bolted together at flanges 12. Member 11 flares radially outwardly at 13 and terminates at its upper end in an outer radial flange 14 to which is bolted a generally radial stationary closure plate 15 with an opening 16 circular in plan and having a downwardly facing outwardly flared, preferably frusto-conical inner edge 17, that is faced if desired with a layer of hard wear-resistant metal 18. Edge 17 and its surface 18 provide a stationary auxiliary or secondary valve seat.

An annular seat member 20 is detachably firmly secured to member 15. Member 20 has a circular, inwardly and downwardly flared preferably frusto-conical inner surface 21, preferably faced with hard wear-resistant metal 22 that acts as a primary stationary valve seat. Member 20 has a lower frusto-conical downwardly and inwardly flared outer surface 23 that fits a mating surface 24 on member 15 accurately to locate member 20 on member 15.

Member 20 is detachably secured to member 15 by a number of slotted pins 25 equiangularly and equidistantly located around the axis A of the valve, and fixed to member 15 and extending through closely fitting openings in member 20. Tapered wedges 26 (FIGS. 4 and 5) are inserted through slots in posts 25 to hold member 20 securely on member 15.

Valve 4 has a movable valve member 30 comprising an axial portion 31 detachably securely mounted on an actuating rod 32 coaxial with the axis of the valve, by a wedge 33 extending through mating slots in member 30 and rod 32. A radial portion 34, preferably integral with axial portion 31, rigidly carries a detachable annular seat member 35 by slotted pins 36 equidistantly and angularly disposed around axis A and fixed on portion 34, and by wedges 37 in the pin slots bearing against member 35. Seat member 35 has an outer downwardly and inwardly flared surface 38, preferably faced with hard wear-resistant metal 39, that acts as a primary movable valve seat and is shaped to fit closely against the primary stationary

valve seat 21 in gas sealing engagement as shown in FIGS. 3 and 4, when movable member 30 is in its normal closed position.

Movable valve member 30 also includes, below portion 34 and preferably integrally fixed to portion 31, a downwardly and outwardly flared and preferably frusto-conical portion 40 the upper surface of the outer edge of which forms a secondary movable valve seat 41 that is adapted closely to fit the secondary stationary valve seat 17 when movable valve member is raised sufficiently.

Body 11 of the valve has rigidly fixed to its interior a number of radially inwardly extending arms 42 that rigidly support a collar 43 through which actuating rod 32 extends and in which it is slidably mounted. Rod 32 itself has fixed to its outer surface a sleeve 44 formed of wear-resistant metal, the length of the sleeve being such that at all times during the reciprocation of the rod the sleeve is in contact with a sleeve 45 fixed inside of collar 43. A sleeve 46, coaxial with and radially spaced from rod 32, has its upper end located in collar 43 and extends with the actuating rod to a location outside of conduit 6, since conduit 6 has a lower portion that is offset from and inclined at a substantial angle to the longitudinal axis of the valve (FIGS. 2 and 3).

If it is desired to insure against leaks around rod 32 of dirty gas from the blast furnace, a fluid such as steam or other clean gas can be injected into the sleeve 46 through an inlet 47 (FIG. 3) at a pressure somewhat higher than the furnace gas pressure, so that if there is any gas leakage there is only a leakage of clean gas into the valve and out around the outer ends of rod 32.

Sleeve 46 joins frusto-conical section 48 (FIG. 3) which is connected to a fluid, preferably air, actuatable cylinder 50.

Rod 32 is detachably connected to piston rod 51 of a piston 52 reciprocable within cylinder 50 (FIG. 3). A rod 54 extends from the other side of the piston through a seal in the bottom of cylinder 50 and connects to a counterweight unit generally indicated at 55 and illustrated in FIGS. 6 and 7. Rod 54 is detachably connected to rod 56 supporting counterweight 57 and extending axially of casing 58 surrounding the counterweight. Rod 56 has a cross plate 59 fixed above the counterweight and a bottom end plate 61 also fixed on rod 56. Plate 61 supports the counterweight, which is made up of weights 62 in number depending upon the counterweight desired. Plate 59 rigidly carries a number of upstanding posts 63 slidably extending through openings in an end plate 64 detachably secured to the upper end of the casing 58 and fixed at their upper ends to each other outside of the casing by a transverse plate 65. Each of posts 63 is surrounded by a shock-absorbing compressible spring 66 contained within the casing between plates 59 and 64, the springs being shorter than the distance between these plates by approximately the distance the movable valve member 30 would normally lift from excessive gas pressure in the furnace.

Plate 64 has four slots 67 (FIG. 7) to receive upwardly extending pins 68 fixed outside of casing 58. Pins 68 have slots to receive wedges 69 that detachably secure plate 64 to the top of casing 58. Rod 56 and counterweight 57 are free to move longitudinally upward in casing 58 when the movable valve member 30 lifts to relieve excessive gas pressure in the furnace, springs 66 striking against the underside of plate 64 to limit the movement while preventing harmful shocks.

In operation of valve 4, counterweight 57 normally pulls movable member 30 down so its primary valve seat 38 contacts the primary stationary valve seat 21 on the valve body 11 to hold valve member 30 in its closed gas sealing position. However, valve member 30 can be pushed upwardly to an open position in which seats 21 and 38 are separated, by force exerted by excessive furnace gas pressure that exceeds the downward force from the weights of member 30, counterweight 57 and other moving parts, or when desired by pressurized air or other fluid supplied through inlet 70 to cylinder 50 below piston 52. After the valve has been opened by excessive furnace gas pressure, the valve member 30 will move

down and close the valve as the gas pressure decreases so its upwardly directed force is less than the downwardly directed force of the weight of the counterweight and other moving parts. If the valve has been opened by cylinder 50 it can be closed by relieving pressure in the cylinder.

The inner opening valve 5, illustrated in FIGS. 2, 8, 9 and 9A, 10 and 11 includes a conduit 7 communicating with downcomer 3 connected to blast furnace 1 through uptakes 2. A hollow stationary valve body or member 72 is secured to the upper end of conduit 7 and has generally radial stationary member 73 fixed to its upper end. This member has an opening 74 circular in plan and having a downwardly facing outwardly flared preferably frusto-conical edge 75 that is faced if desired with a layer of hard wear-resistant metal. Edge 75 provides a stationary auxiliary or secondary valve seat.

A seat member 77 annular in form is detachably secured to member 73. Member 77 has an inwardly and downwardly flared, preferably frusto-conical circular inner edge 78, preferably faced with hard, wear-resistant metal, that acts as a primary stationary valve seat. Member 77 also has an outwardly facing downwardly and inwardly flared frusto-conical surface 81 that contacts a mating surface 82 on member 73 so that seat member 77 is accurately located on member 73.

Member 77 detachably connected to member 73 by a number of slotted pins 83 equiangularly and equidistantly located around the axis B and fixed to member 73. These pins extend through closely fitting openings in member 77. Wedges 84 inserted through slots in the pins hold members 77 securely on member 73.

A movable valve member 85 has a radial portion 86 fixed to the top of an actuating rod 87. The radial portion carries an annular seat member 88 that is detachably secured to the radial portion by slotted pins 89 equidistantly and angularly disposed around and secured to portion 86 and by wedges 91 in the slots of the pins firmly holding member 88 on portion 86. Member 88 has an outer facing downwardly flared circular edge 92, preferably faced with hard wear-resistant metal, that acts as a primary movable valve seat and is shaped to fit closely against primary stationary valve seat 78 in gas sealing engagement, as shown in FIGS. 8 and 9 when movable member 85 is in its normal closed position.

Movable valve member 85 also includes a downwardly and outwardly extending flared portion 94 preferably frusto-conical in shape, over which the outer edge of seat member 88 extends and fits closely so that member 88 is accurately located on radial portion 86. The upper surface of the outer edge of the flared portion forms a secondary movable valve seat 95 which may be faced with hard metal, that can closely fit the secondary stationary valve seat 75 when the movable valve member is raised sufficiently, as in FIG. 9A.

A number of radially inwardly extending arms 96 are fixed to the interior of the body 72, and at their inner ends support a collar 97 through which actuating rod 87 extends and in which it is slidably mounted. The rod on its outer surface has a sleeve 98 of wear-resistant metal, the length of the sleeve being such that at all times during reciprocation of the rod the sleeve is in contact with a wear sleeve 99 fixed inside collar 97.

A sleeve 101 coaxial with and radially spaced from rod 87 has its upper end located in collar 97 and extends along and with the actuating rod downwardly through conduit 7 to a location outside of and below conduit 7, since conduit 7 has a lower portion that is offset from and inclined to the axis of the valve and its actuating rod 87 and sleeve 101 (FIGS. 2 and 8).

If desired, movable valve member 85 is detachably firmly secured to the top of the rod by a wedge 102 extending through mating slots in the member and the rod.

If it is desired to insure against leakage of dirty blast furnace gas around the rod, steam or other clean gas can be injected into sleeve 101 through an inlet 103 at a pressure somewhat higher than the furnace gas pressure, so that if there is any leakage, it will be leakage of clean gas into the valve or out around the bottom of the rod.

As shown in FIG. 11, rod 87 is detachably connected to a piston rod 104 of a piston 105 reciprocable within cylinder 106. When desired, air or other fluid under pressure can be introduced into cylinder 106 above and on the rod side of the piston to force the piston and hence the movable valve member down to an open position of the movable member in which seats 78 and 92 are spaced apart to permit venting of gas. Compression springs 108 are provided to operate between the opposite side of the piston and the blind end of the cylinder to resist downward movement, provide shock absorption and to bias the piston and movable valve member upwardly. The spring force together with the pressure of the gas in the valve body, normally holds the movable valve member 85 in closed position with its primary seal seat 92 in sealing contact with the primary seat 78 of the body, to keep the valve closed.

The other inner opening valve 5 on conduit 8 is identical in construction and operation with that of FIGS. 8-11, except that its conduit 8 is longer. Conduit 8 also has a lower inclined portion to permit the lower end of sleeve 101 and actuating cylinder 106 to be outside the conduit.

When it is desired to change or repair the hard metal wear elements on the movable or stationary valve members of either of the above described valves, especially those providing the primary valve seats, the valve may be easily reached by a workman and quickly disassembled and reassembled as indicated below. The absence of overhead equipment or apparatus around or about the valve, such as an overhead lever and associated parts of conventional bleeder valve apparatus, considerably simplifies the workman's task and makes it possible to carry it out more easily, rapidly and safely.

The seats of the outer opening valve 4 can be repaired or replaced by removing wedges 69 from posts 68 of the counterweight apparatus, wedges 26 from the pins 25 of the stationary valve member, and wedges 37 from the pins 36 of the movable valve member. Actuating rod 32 and movable valve member 30 carried by it is then moved upwardly by admitting pressurized fluid through inlet 70 into cylinder 50 until the movable member is moved to its open position shown by broken lines 30' (FIG. 4). The seat member 35 carrying the primary seat of the movable member is then lifted off over the top of the movable member, and the seat member 20 carrying the stationary primary valve seat is thereafter lifted off vertically over the movable member, the outer diameter of the upper radial portion 34 of the movable member being sufficiently smaller than the smallest internal diameter of member 20 to permit this. The absence of any parts connected to the upper portion of the movable member makes possible such easy removal of members 20 and 35.

If hard metal wear surfaces on the movable member 30 and stationary members 15 need replacement or repair, they can then be replaced or repaired without removal of these members, although these members can be removed if desired. The parts can be reassembled in the reverse order. That is, assuming the wear surfaces on members 15 and 30 are satisfactory, the seat member 20 can first be installed over the top of the movable member and put in place on the stationary member 15 and secured by driving wedges 26 into pins 25, after which seat member 35 can be installed on portion 34 of the movable member and secured by wedges 37 in pins 36.

While member 20 is off, movable member 30 can be located in a raised or repair position so that the secondary seat 41 of portion 40 of the movable member is in contact with the secondary seat 18 of the stationary member (FIG. 4A) to seal against the escape of gas which might through accident or other causes pass into the uptakes. Increased safety is thus provided. The portion 40 also thus acts as a stop to limit upward movement of member 30. Moreover, the downwardly extending flared portion 40 at this time and when the valve is open to vent gas from the furnace, inhibits flow of dust out of the valve by directing dust downwardly back into the conduit 6 and downcomer 3. Furthermore, portion 40 also can if necessary rest on arms 42 to prevent dropping of the movable

member into the conduit 6 if there should be failure of air in cylinder 50 or other failure of support for movable member 30 while seat member 25 is off the movable member.

A somewhat similar procedure is used for repair of the inner opening valve. In this case, the wedges 84 and 91 are removed from the pins 83 and 89, thus releasing the seat members 77 and 88 containing seals 78 and 92. Preferably, the movable member 85 is then retracted downwardly to provide clearance between the seals. The stationary seat member 77 is then lifted off.

The movable member is then preferably raised to the repair position shown in FIG. 9A, and the seat member 88 of the movable member removed. In this position the downwardly flared portion 94 by its secondary seat 95 bears against the secondary seat 75 of member 73, thus preventing escape of gas if gas is present in conduit 7 during repair. Portion 94 acts also as a stop limiting upward movement of member 85. Moreover, portion 94 can if necessary rest on arms 96 and prevent the movable member 85 from dropping into conduit 7 in the event of any failure of the means for supporting member 85. This portion 94 also acts to divert dust downwardly when the valve is open in normal use, and thus reduces dust that escapes into the atmosphere from the valve while it is used to relieve pressure.

While the members 73 and 88 containing the primary seats are removed, the secondary seats may be repaired if desired.

Members 73 and 88 can be installed in the reverse order. That is, seat member 88 may be installed on the movable member by placing it over the end of the member and locating it, and then installing wedges 91 in pins 89 to secure member 88, then lowering the movable member 85 sufficiently to permit the location of seat member 77 on the stationary portion of the valve and inserting wedges 84 into pins 83 to secure member 77.

Both the inner opening and the outer opening valves disclosed above are simple and rugged in construction. As indicated, the wearable or movable parts of the valve seats can be readily replaced in a short time with little effort and with increased safety to workmen. Since the time for replacing these parts is drastically reduced as compared to that required for conventional bleeder valves, the loss of production time in a blast furnace is greatly reduced.

Various modifications may be made in the illustrated embodiments. It is intended the patent shall cover by suitable expression in the appended claims whatever features of patentable novelty reside in the invention.

What is claimed is:

1. Blast furnace bleeder valve apparatus comprising a hollow body member having an upper portion comprising a valve seat; a valve member movable reciprocally in a substantially vertical path between closed and open position and having a valve seat adapted to engage said valve seat of said body member in substantially gas-sealing relation when said movable valve member is in its closed position and to be spaced from said valve seat of said body member to permit escape of gas when said movable member is in an open position; conduit means communicating with the interior of said body member and with the interior of the blast furnace with which said valve apparatus is associated; means for reciprocally supporting said valve member from below said valve member, said supporting means extending to a location outside said conduit means; and means connected to the portion of said supporting means extending outside said conduit means for biasing said movable valve member to its closed position, the upper portion of said valve apparatus being substantially unobstructed to permit substantially unobstructed access to the top of said valve apparatus and to said valve seats.

2. The apparatus of claim 1 in which said body member detachably securely carries upwardly removable seat means providing said valve seat of said body member.

3. The apparatus of claim 1 in which said valve member detachably securely carries upwardly removable seat means providing said valve seat of said valve member adapted to engage said seat of said body member.

4. The apparatus of claim 1 in which said body member detachably securely carries upwardly removable seat means providing said valve seat of said body member, and in which said movable valve member detachably securely carries upwardly removable seat means providing said valve seat of said valve member adapted to engage said seat of said body member.

5. The apparatus of claim 1 in which said means supporting said movable valve member is rod means that is connected to said movable valve member and extends downwardly from said movable valve member to said location outside said conduit means.

6. The apparatus of claim 1 in which said movable valve member is biased downwardly to its closed position and is movable upwardly to an open position to release gas from said valve apparatus.

7. The apparatus of claim 6 in which said upwardly opening valve member is biased downwardly by counterweight means attached to the portion of the supporting means that extends outside said conduit means.

8. The apparatus of claim 7 comprising means for raising said movable valve member to its open position when it is desired to open the valve apparatus.

9. The apparatus of claim 7 in which said body member has an opening therein after removal of said seat means of said body member that is large enough to permit upward removal through said opening of the seat means from said movable valve member.

10. The apparatus of claim 6 comprising seat means detachably firmly secured to said body member and upwardly removable therefrom for providing said body member valve seat, and also including seat means detachably firmly secured to said movable valve member and upwardly removable therefrom providing said movable valve member seat, the cross sectional shape of said movable valve member after removal of its seat means being small enough to permit the upward removal of said seat means from said body member over said movable member.

11. The apparatus of claim 1 in which said movable valve member opens into the valve body to an open position to release gas from said valve apparatus, and in which said movable valve member is biased upwardly to its closed position.

12. The apparatus of claim 11 comprising means connected to said supporting means for said movable valve member to move said movable valve member downwardly to an open position when it is desired to open the valve apparatus.

13. The apparatus of claim 1 in which said means for reciprocally supporting said movable valve member extends through a sleeve that at one end thereof communicates with said body member and that extends outside of said conduit means at its other end, and which includes means for introducing clean gas into said sleeve at a pressure at least equal to the pressure in the blast furnace so that any leakage that occurs will be leakage of clean gas.

14. Valve apparatus comprising a first valve member having means providing a normally operative first seat and a normally inoperative second seat; a second valve member movable with respect to said first valve member and comprising a first seat normally engageable with said first seat of said first valve member and a second seat optionally engageable with said second seat of said first valve member, at least one of said first and second valve members having detachable means providing one of said seats; conduit means connected to said first valve member and communicating with a source of fluid that is to be vented by said valve apparatus, a rod means secured to said second valve member and adapted to move it toward and away from said seats of said first valve member, between a position in which said first seat of said second valve member engages said first seat of said first valve member to provide normal substantial gas sealing engagement, to a position in which said seats are spaced to provide for venting of fluid from said valve apparatus, said rod also being adapted to move said second valve member to a position where its second seat engages said second seat of said first valve member, said rod

means extending away from said seats within said conduit means to a position outside of said conduit means; and means to bias said rod means so that the first seats of said first and second valve members are engaged.

15. The apparatus of claim 14 in which said first valve member has seat means providing said first seat that is detachably firmly secured to said first valve member.

16. The apparatus of claim 14 in which said second valve member has means providing said first seat that is detachably firmly secured to said second valve member.

17. The apparatus of claim 14 in which said valve apparatus has the portion thereof on the opposite side of said second valve member from which said rod means extends substantially completely unobstructed to permit access to at least said first seats of said first and second valve members.

18. Blast furnace bleeder valve apparatus adapted to be

mounted on a blast furnace, conduit means adapted to communicate with said blast furnace, and a plurality of bleeder valves mounted along the length of said conduit means, each of said bleeder valves having a body member and a movable valve member that is supported by rod means from below the movable valve member, said rod means extending outside of said conduit means, and means connected to a portion of said rod means extending outside of said conduit means for biasing the movable valve member to a closed position.

19. The apparatus of claim 18 in which at least one of said valves has counterweight means connected to said rod means to bias the movable member downward to closed position.

20. The apparatus of claim 18 in which at least one of said valves has means to bias the movable valve member upwardly to a closed position.

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