March 24, 1964 N. T. KURFISS 3,126,028

SEAL FOR BLEEDER VALVES

Filed April 13, 1961

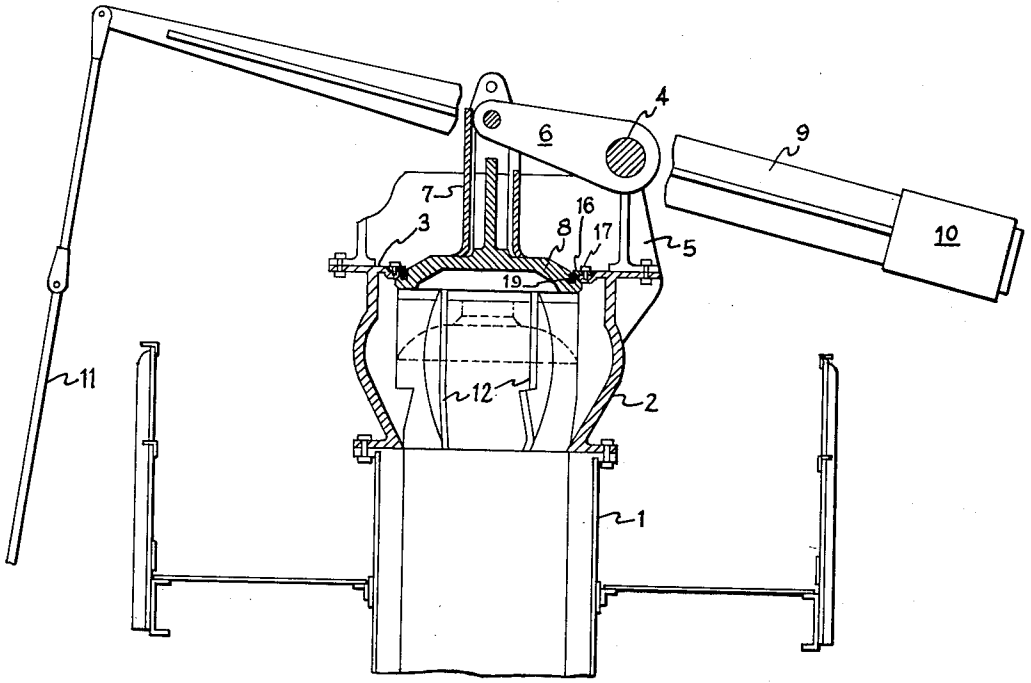


FIG. 1.

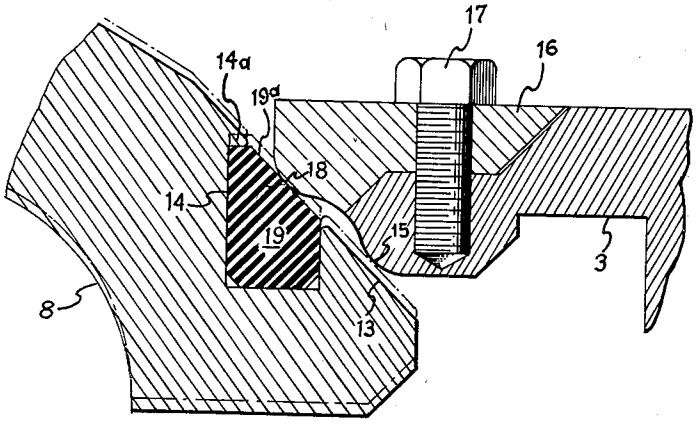


FIG. 2.

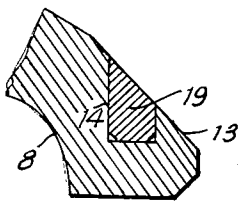


FIG. 3.

INVENTOR.
NEAL T. KURFISS,
BY
Allen & Allen
ATTORNEYS.

United States Patent Office 3,126,028 Patented Mar. 24, 1964

3,126,028

SEAL FOR BLEEDER VALVES

Neal T. Kurfiss, Middletown, Ohio, assignor to Armco Steel Corporation, Middletown, Ohio, a corporation of Ohio

Filed Apr. 13, 1961, Ser. No. 102,832
7 Claims. (Cl. 137—329.01)

The invention relates to the solution of problems connected with the provision of bleeder valves for blast furnaces.

As is well known, the top portion of a blast furnace is normally provided with a plurality of uptakes which serve as exit means for the furnace gases. These uptakes are interconnected by a manifold having a downcomer for conducting the furnace gases to a solids separator and thence to a gas washer. The uptakes at their tops are provided with bleeder valves which are either manually or automatically operated for the purpose of relieving sudden pressure excesses inside the furnace.

The gases from the blast furnace are at an elevated temperature and have large quantities of finely divided and highly abrasive solids entrained in them, so the gases are known as "dirty gases." When a bleeder valve is opened, the rush of the abrasive-laden gases past the separated valve tappet and seat cuts and scores these elements, permitting leakage when the valve is again closed. Once a bleeder valve begins to leak, the cutting action proceeds very quickly because of the channeling of the abrasive-laden gases.

Thus it is necessary frequently to replace the active parts of the bleeder valves, which is a source of great expense and inconvenience, and which cuts down the productive capacity of the furnace since the conventional valve can be repaired or replaced only when the blast is taken off the furnace.

It is an object of this invention to provide a valve structure which is not subject to erosion as described above, or in which erosion is greatly minimized.

It is an object of the invention to provide a bleeder valve with an effective seal of the compressive type which will compensate for erosion for a substantial length of time.

It is an object of the invention to provide a bleeder valve with two seals whereby the elements forming one seal can remain in closed position during the repair and replacement of the elements forming the other seal, so that such repair and replacement can be carried on without opening the valve and hence without taking the blast off the furnace.

These and other objects of the invention which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications are accomplished by that certain construction and arrangement of parts of which an exemplary embodiment will now be described. Reference is made to the accompanying drawings wherein:

FIGURE 1 is a vertical sectional view of a typical bleeder valve to which the present invention is applied.

FIGURE 2 is a partial enlarged sectional view showing the specific coaction of the tappet and seat members.

FIG. 3 is a partial sectional view of the elements **8** and **19**, illustrating the element **19** as metal.

The particular valve illustrated in FIGURE 1 is of a type in which the tappet moves away from the seat in a downward direction. Types of bleeder valves in which the tappet moves upwardly away from the seat are equally well known. The skilled worker in the art will understand, in the light of the teachings herein, how the invention may be applied to either type; and indeed in FIGURE 2 hereof the right hand element may be considered either a part of the tappet or the valve seat part of the body, while the left hand element may be considered either the seat or the tappet as the case may be.

In FIGURE 1, the upper end of an uptake is indicated at **1**. The bleeder valve includes a bowl-shaped casting surmounted by a cast element **3** of annular form which serves as the valve seat. A shaft **4** is journaled in brackets (one of which is shown at **5**) on the bowl, and carries a lever arm **6** which is pivoted to a riser portion **7** of a valve tappet **8**. A projecting end of the shaft **4** carries a lever arm **9**, counter-weighted as at **10** and provided at its other end with an operating cable **11**. Within the bowl **2** there may be guide elements **12** for the movement of the tappet **8**. As thus far described, the bleeder valve is conventional.

FIGURE 2 shows the coaction of the parts forming the seal of this invention. As explained above, this figure shows the two opposite valve parts; and while the lefthand part has been illustrated to comport with the showing of the tappet **8** in FIGURE 1, with the right hand part comporting with the valve seat portion **3**, these parts may be reversed, so that the member **8** becomes a part of the body of the bleeder valve and the member **3** becomes a part of the tappet.

As illustrated, one of the valve parts, in this instance **8**, is characterized by a downwardly and inwardly sloping surface **13**, above which there is a recess **14**. The other valve part **3** is configured opposite the surface **13** so as to present a nose **15**. A separate and removable metallic member **16** in the form of an annulus, lies on and is held to the member **3** as by bolts **17**. This separate metallic member is also configured to present an annular nose **18** lying opposite the recess **14**. The recess **14** contains a member **19** having a surface **19***a* coacting with the nose **18** on the member **16**. In the practice of the invention, the member **19** may be made of various substances including metal; but preferably it is made of resilient, heat-resisting substance, and will first be so described.

The shape of the recess **14** may be that shown or may be varied within the limits of shapes which will hold the resilient member **19**, the cross section of which may also be changed; but the resilient member will have a surface **19***a* generally coplanar or nearly so, with the surface **13**. The recess may have a slight overhang as at **14***a* in order to assist in retaining the resilient member.

The resilient member may be made of natural rubber, any of the synthetic rubbers, or of chloroprene such as neoprene. Preferably it is made of a material resistant to oxidation at somewhat elevated temperatures; and best results have been obtained through the use of silicone rubber. As exemplary, a silicone rubber having a durometer hardness of 50 plus or minus 5, a tensile strength of 825 pounds per square inch and an elongation of 350% has been found very serviceable.

FIGURE 2 illustrates the positions of the parts upon the first contact of the nose **18** of the separate metallic member **16** with the resilient member **19**. When the valve is fully closed, the member **8** may occupy the position shown in FIGURE 2 in dotted lines, in which position the nose **18** will have deflected the resilient member **19** to a degree as will be evident. In the fully seated position, the nose **15** preferably lies against the surface **13**; but with the resilient member **19** compressed and deflected by the nose **18**. The exact extent of the deflection is not a necessary limitation on the invention; but in an exemplary embodiment the deflection is about ¼ inch. In testing for the desired heat resistance and resiliency under heat, a suitable material for the resilient member **19** after being tested for twenty-four hours at a temperature of 350° F., with a deflection of ¼ inch, showed a permanent set no greater than 1/16 inch.

The valve of this invention thus forms a gas-tight seal

between the metallic nose **18** and the resilient substance **19** which prevents the escape of the dirty furnace gas. Hence there will be no flow of gas through the valve when the valve is closed; and the seal will be effective despite any slight erosion of the nose **18** during the relatively brief intervals when the valve is open.

However, the valve parts of this invention are readily renewed without shutting down the furnace or decreasing the furnace top pressure. It will be seen in FIGURE 2 that the member **16** may be removed upon removal of the bolts **17**. A seal or closure will still be maintained by the engagement of the nose **15** with the surface **13**. The member **16** when removed or drawn to one side, will completely uncover the recess **14**. The resilient substance **19** may then be removed from the recess and a fresh piece of resilient substance inserted. It will be understood that the recess **14** is annular. The resilient substance **19** is preferably handled in the form of a strip of indefinite length. It may be laid in the recess, and its ends may be cut so as to come together therein preferably under slight compressive pressure. Further, it is possible to replace the entire member **16**, if it is desired.

While a resilient and compressible member **19** is preferred, it is possible to use other substances (see FIG. 3). A ring of metal may be placed in the recess **14** (the overhang **14***a* being eliminated). It is also possible to form the annular member **19** from a strip of bendable metal in the way hereinabove described for the use of a strip of resilient substance. Certain of the advantages of the invention may be obtained even if the recess **14** and member **19** are omitted and the surface **13** of member **8** continued to coact with nose **18** as well as nose **15**.

Modifications may be made in the invention without departing from the spirit of it. The invention having been described in an exemplary embodiment, what is claimed as new and desired to be secured by Letters Patent is:

1. In a bleeder valve construction, a body, relatively movable metallic members serving respectively as a valve seat and a valve tappet, one of said members having a substantially conical surface with an annular recess located intermediate the edges thereof and adapted to contain a renewable valve seat structure, a body of resilient substance within said annular recess, the other of said members being configured to provide a first nose positioned for valving coaction with the surface of said first mentioned member, and a second nose coacting with the surface of said resilient substance, the said second nose being formed on a metallic body removably mounted upon the valve member having said first nose, the parts being so related that when said metallic body is removed from said valve members, the said annular recess in the first mentioned valve member will be uncovered for removal and replacement of the body of resilient substance therein.

2. The structure claimed in claim 1 wherein the resilient substance is a rubbery composition of heat resistant characteristics and a resiliency such that a seal may be formed between it and said second mentioned nose when the valve is in fully closed position, at which time the first mentioned nose is in contact with conical surface.

3. The structure claimed in claim 1 wherein said body of resilient substance is completely enclosed in said annular recess except for such surface coacting with said second nose.

4. In a bleeder valve construction, a body, relatively movable metallic members serving respectively as a valve seat and a valve tappet, one of said members having a substantially conical surface with an annular recess located intermediate the edges thereof, and containing a renewable valve seat structure, the other of said valve members having a pair of noses for effecting valve sealing contacts, one of said noses being formed on a metallic body removably mounted upon said other valve member, the parts being so related that when said removable member is removed, the said annular recess will be uncovered for the removal and replacement of the said renewable valve seat structure.

5. In a bleeder valve construction, a body, relatively movable metallic members serving respectively as a valve seat and a valve tappet, one of said members having a substantially conical surface with an annular recess located intermediate the edges of said conical surface and containing a renewable valve seat structure, the other of said members being configured to make valve-closing contact both with said renewable structure and with said conical surface, that portion of the said other of said valve members which makes valve-closing contact with said renewable structure being located on a metallic body removable from the said other valve member and so configured that, when so removed, it will uncover the said annular recess to permit renewal of the renewable valve seat structure located therein while the said bleeder valve remains otherwise closed.

6. The structure claimed in claim 5 wherein the said renewable valve seat structure is formed of a distortable substance.

7. In a bleeder valve construction, a body, relatively movable metallic members serving respectively as a valve seat and a valve tappet, one of said members having a substantially conical surface, the other of said members having a surface configuration such as to effect valve-closing contact with said first mentioned member in substantially concentric annular areas, one of said members having an annular recess containing a renewable valve seat structure, and the other of said members having a removable annular portion, the parts being so related that when said removable portion is removed, the said annular recess will be uncovered for removal and replacement of the renewable valve seat structure, while the valve otherwise remains in closed position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,665,394	Willoughby	Apr. 10, 1928
2,418,200	Smith	Apr. 1, 1947
2,657,897	Folmsbee	Nov. 3, 1953
2,949,127	Malina	Aug. 16, 1960
2,982,515	Rule	May 2, 1961
2,995,057	Nenzell	Aug. 8, 1961

FOREIGN PATENTS

549,291	Canada	Nov. 26, 1957