

Dec. 4, 1945.

H. O. JOHNSON ET AL

2,390,150

VALVE

Filed Aug. 9, 1943

2 Sheets-Sheet 2

FIG. 3.

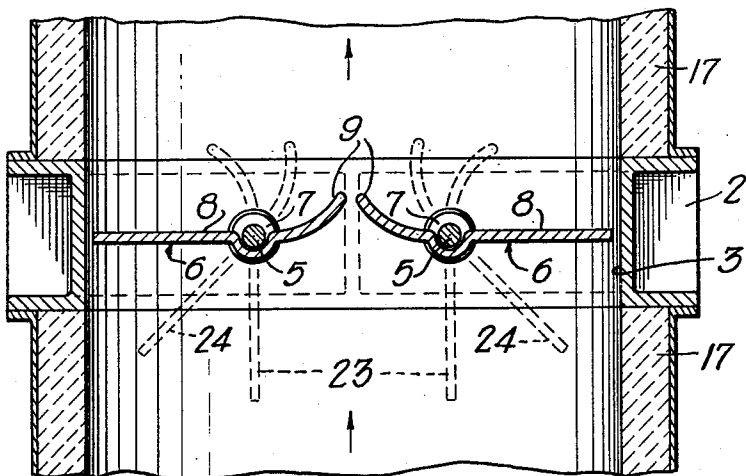
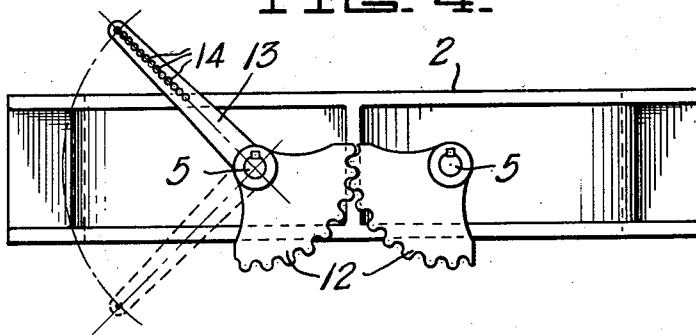


FIG. 4.



INVENTORS.
HARRY O. JOHNSON
and MARTIN O'HARE
by: John E. Jackson
Attorney.

Dec. 4, 1945.

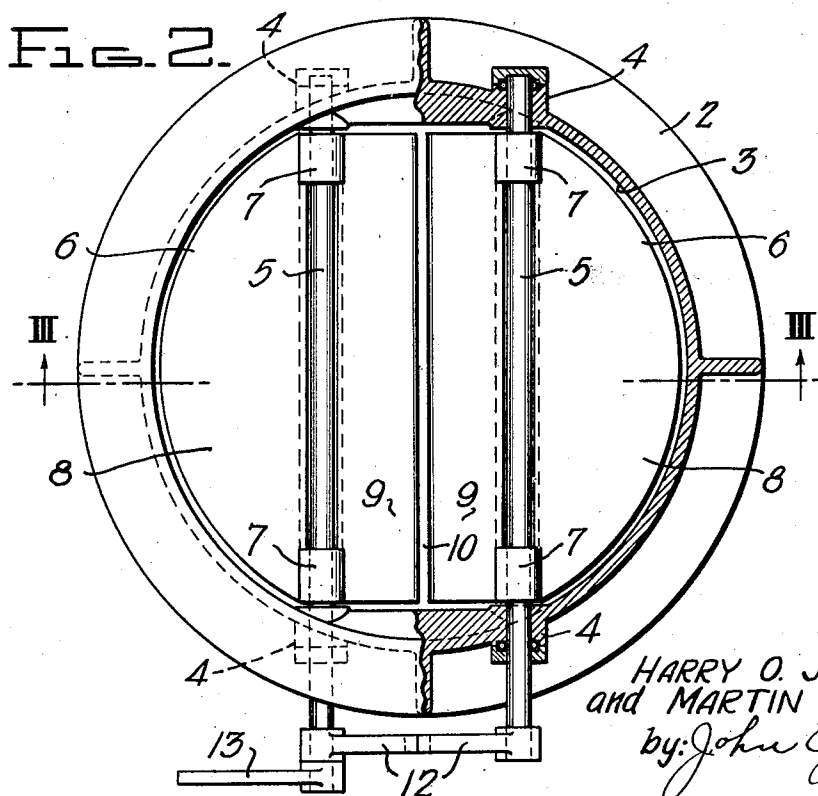
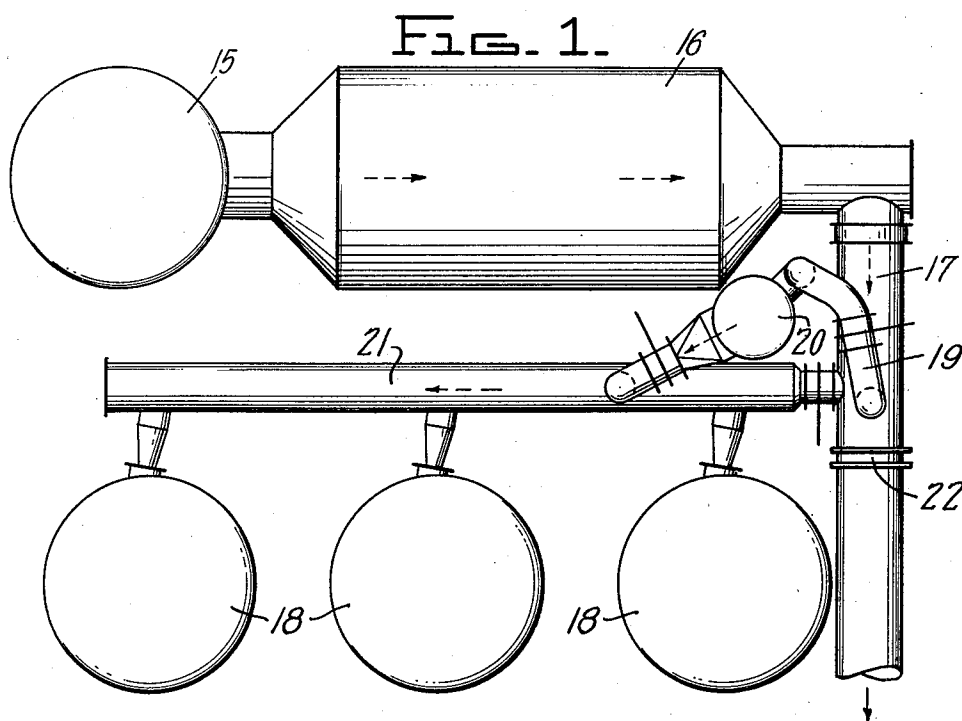
H. O. JOHNSON ET AL

2,390,150

VALVE

Filed Aug. 9, 1943

2 Sheets-Sheet 1



INVENTORS.
HARRY O. JOHNSON
and MARTIN O'HARE
by John E. Jackson
Attorney.

UNITED STATES PATENT OFFICE

2,390,150

VALVE

Harry O. Johnson and Martin O'Hare, Donora, Pa., assignors to The American Steel and Wire Company of New Jersey, a corporation of New Jersey

Application August 9, 1943, Serial No. 497,996

4 Claims. (Cl. 277—1)

This invention relates to valves and, particularly, to an improved valve for use in connection with the exhaust gas system of blast furnaces and the like.

In the operation of a blast furnace in the steel industry, it is the general practice to convey the waste or exhaust gases from the blast furnace to a dust catcher, and thence both through a washing apparatus to the stoves used in connection with the operation of the furnace and to the boiler house for further use. It is customary to carry the gases from the dust catcher to the boiler house in a relatively large conduit or pipe and a relatively smaller conduit or pipe leading to the stoves is connected to this larger pipe or conduit at a point intermediate the length thereof. It is necessary, in order to provide sufficient flow of the gases to the stoves, to incorporate a valve in the large conduit at a point immediately beyond the connection therewith of the line leading to the stoves so as to provide sufficient back pressure in the large conduit in order to force the required volume of gases through the gas washer and into the stoves, and, at the same time, permit sufficient gases to continue to flow through the large conduit to supply the boiler house.

Heretofore, a conventional type of butterfly valve was generally used for such purpose which consisted usually of a disk rotatable on a diametric axis, similar to a damper, which was opened and closed the required amount to restrict the flow of gases through the large conduit. A valve constructed in such a manner is unsatisfactory for the reason that the gases not only eroded the rotatable disk but the gases were deflected thereby against the inner side walls of the conduit and due to the fact that the gases are still laden, at this point in their travel, with a small amount of flue dust from the blast furnace, the gases in impinging against the disk and inner walls of the conduit eroded the same and eventually wore them away. As a result, it will be seen that the disk and the inner side walls of the large conduit or pipe would have to be replaced or repaired rather frequently which was inconvenient as well as expensive.

Accordingly, it is the general object of the present invention to provide an improved valve wherein all of the above mentioned disadvantages are eliminated.

It is another object of this invention to provide an improved valve which is constructed and arranged so that the gases or fluid flowing there-through are deflected toward the center of the valve and the opening therethrough thereby elim-

inating any impingement of the gases against the inner walls of the pipe or conduit with which the valve is incorporated.

It is a further object of this invention to provide an improved valve for the gas line of a blast furnace which will create effectively a back-pressure in the system so as to permit the required volume of gases to flow to the stoves and, at the same time, permit sufficient flow of the gases to the boiler house.

It is still another object of our invention to provide an improved valve which is simple and inexpensive in its construction and use, and one consisting of a minimum number of parts which having a relatively long life thereby eliminating maintenance and replacement costs.

Various other objects and advantages of this invention will be more apparent in the course of the following specification and will be particularly pointed out in the appended claims.

In the accompanying drawings there is shown, for the purpose of illustration, an embodiment which our invention may assume in practice.

In these drawings:

Figure 1 is a plan view showing schematically the arrangement of the dust catcher, the gas washer and stoves of a blast furnace and the exhaust gas line with which the improved valve of our invention is incorporated;

Figure 2 is an end view, partly in section, of the improved valve of our invention;

Figure 3 is a sectional view taken on line III—III of Figure 2; and

Figure 4 is a side view of our improved valve showing how the same is actuated.

Referring more particularly to the drawings, the improved valve of our invention, as shown in Figures 2, 3, and 4, comprises an annular body member 2 which consists of a steel or iron casting having an axial opening 3 arranged therethrough with the opening 3 having a diameter substantially equal to the inner diameter of the pipe or conduit with which the valve is adapted to be used. There is journaled in suitable bearing portions 4 carried by the annular member 2 and extending across the opening 3 therein, a pair of spaced apart parallel shafts 5 so as to divide the opening 3 into three sections.

There is carried by each of the shafts 5, a plate member 6 which is securely attached to the shafts preferably by means of the portions 7 integrally arranged on the plates at each end thereof so as to provide a so-called flap valve which is similar to a butterfly type valve. The portion of each of the plates 6 disposed on the outer sides of the

shafts 5 directly opposite the inner periphery of the annular member 2 is substantially flat as at 8. The inner opposed ends of each of the plates 6, that is, those portions disposed on the inner sides of the shafts and between the same are arcuated outwardly in the direction of the flow of the fluid through the valve as at 9. The extreme inner opposed ends of the arcuated portions 9 are preferably spaced from each other when the valve is closed so as to provide a relatively small slotted opening 10 therebetween diametrically of the valve at substantially the center thereof.

One end of each of the shafts 5 extends through the wall of the body member 2 to a point beyond the outer periphery thereof, and there is securely arranged on each of the outwardly extending shaft ends, a segmental gear 12 which intermesh with each other so that the shafts 5 and the plates 6 carried thereby are moved simultaneously to open and close the valve when one of the shafts 5 is rotated. There is also secured to one of the shafts 5, preferably, a lever 13 which may be connected to an automatic regulator (not shown). There is arranged in the outer end of the lever 13, preferably, a plurality of holes 14 for adjusting the stroke of the regulator relative to the valve.

In Figure 1 of the drawings, there is shown schematically the arrangement of pieces of apparatus used in connection with the operation of a blast furnace and with which the valve of our invention is adapted to be used. There is provided a vertical dust catcher 15, a horizontal dust catcher 16, and there is connected to the outer end of the dust catcher 16, a relatively large pipe or conduit 17 for conveying the exhaust or waste gases from the dust catcher to the stoves 18 and to the boiler house to which the broken off end of the pipe 17 leads. There is connected to the large conduit or pipe 17, just beyond the dust catcher 16, a relatively small pipe or conduit 19 which leads to a gas washer 20, and the gas washer in turn is connected to a gas main 21 which, in turn, delivers the gases to the stoves 18 connected thereto.

At a point immediately beyond the connection of the relatively small pipe 19 leading to the gas washer 20 and the stoves 18, there is arranged in the large pipe or conduit 17, the improved valve of our invention which is designated as at 22. As hereinbefore explained, it is the purpose of the valve 22 to maintain a back-pressure in the conduit 17 of a predetermined amount so that the pressure thus created is sufficient to force the required volume of the exhaust gas through the gas washer 20 and into the stoves 18, and at the same time permit sufficient of the exhaust gases to pass through the line 17 to supply the boiler house connected thereto.

In the full lines of Figure 2 of the drawings, the plates 6 are shown in their closed position. It will be seen that when the plates are moved through substantially 90° that they are then disposed in their fully opened position with the flat portions 8 thereof disposed substantially parallel to each other, to the side walls of the conduit 17 and to the path of the gases therethrough and that the arcuated portions 9 are directed toward the respective inner side walls of the pipe, as shown in the broken lines of Figure 3 of the drawings, as at 23. The valve is very seldom operated in its fully opened position as shown at 23, but usually operates in a closed position or in some position between the closed and the angular position shown in the dotted lines indicated at 24. When the plates 6 are disposed in such operating

positions, it will be seen that the arcuated portions 9 thereof are curved in the direction of the flow of gases through the valve and prevent a direct vertical impingement of the gases thereon thus prolonging the life of the plates. It will also be seen that the arcuated portions will deflect the gases toward the center of the valve and the pipe 17 as will the flat portions 8 thereof thereby eliminating any danger of the gases being deflected so as to impinge against the inner side walls of the pipe 17.

As a result of our invention, it will be seen that there is provided an improved valve which may be conveniently attached to a regulator or other means for controlling the opening and closing the same so as to provide the desired balance of pressure required for satisfactorily delivering the exhaust gases to the washer 20 and stoves 18 connected thereto and to the boiler house.

While we have shown and described one specific embodiment of our invention, it will be understood that this embodiment is merely for the purpose of illustration and description and that various other forms may be devised within the scope of our invention, as defined in the appended claims.

We claim:

1. A valve of the class described, comprising a hollow annular body member, a pair of oppositely disposed substantially semi-circular plate members whose central portions are pivotally mounted in said body member and constructed and arranged so as to provide a flap valve with the inner opposed end portions of each of said plates arcuated outwardly in the direction of the fluid flow through the valve, whereby the fluid which passes to and through the valve impinges the plate members and is deflected toward the center thereof by said arcuated inner end portions, said arcuated portions thus jointly defining a converging passageway between the plate members when the valve is in closed position as well as when it is partially open.

2. A valve of the class described, comprising a hollow annular body member, a pair of spaced-apart parallel shafts journaled in said body member and extending across the opening therethrough, and a respective substantially semicircular plate member securely attached at its central portion to each shaft, the plate members being constructed and arranged to provide a flap valve with the inner opposed ends of each disposed on the inner sides of said shafts between the same arcuated outwardly in the direction of fluid flow through the valve, whereby the fluid which impinges the plate members and passes to and through the valve is deflected toward the center thereof by said arcuated inner end portions, the latter portions thus jointly defining a converging passageway between the plate members when the valve is in closed position as well as when it is partially open.

3. A valve of the class described, comprising an annular body member, a pair of spaced-apart parallel shafts journaled in said body member and extending across the opening therethrough, said shafts being in a plane perpendicular to the axis of the opening through said body member, and a respective semicircular shaped plate whose central region is securely attached to each shaft so as to provide a flap valve with the inner opposed ends of said plates disposed between said shafts arcuated outwardly in the direction of fluid flow through the valve, whereby the fluid passing to

and through the valve will be deflected toward the center thereof by said arcuated inner end portions, said latter portions jointly defining a converging passageway between the plate members when the valve is in closed position as well as when it is partially open.

4. A valve of the class described, comprising an annular body member, a pair of spaced-apart parallel shafts journaled therein and extending across the opening therethrough, and a respective substantially semicircular plate securely attached at its central region to each shaft, the portions of said plates disposed on the outer

5 sides of said shafts being substantially flat and the portions thereof disposed on the inner sides of and between said shafts being arcuated in the direction of the fluid flow through the valve, whereby the fluid impinging the plate members and which is adapted to pass to and through the valve will be deflected toward the center thereof by said arcuated inner end portions, the latter portions of the plates jointly defining a converging passageway when the valve is in closed position as well as when it is partially open.

HARRY O. JOHNSON.
MARTIN O'HARE.