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BLAST FURNACE CONSTRUCTION

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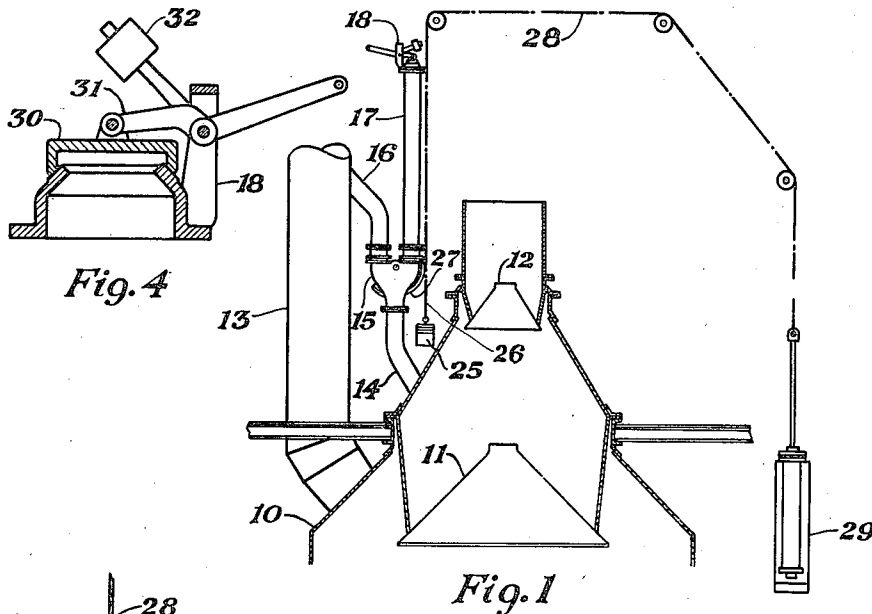


Fig. 4

Fig. 1

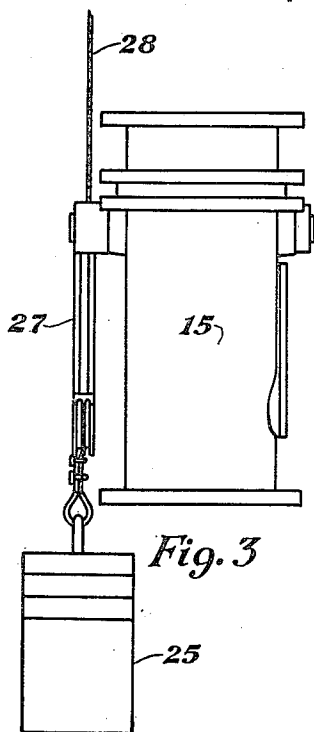


Fig. 3

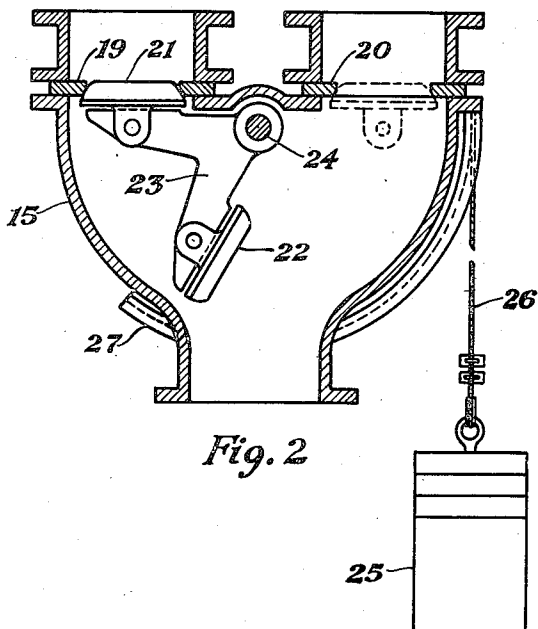


Fig. 2

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BLAST FURNACE CONSTRUCTION

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2 Claims. (Cl. 266—27)

The present invention relates to improvements in blast furnace construction.

In blast furnace construction, it is common to provide a pair of bells arranged in series, commonly termed a large bell and a small bell, which said bells may be opened alternatively for the admission of materials into the furnace. The material is deposited on the small bell. Said small bell, while the large bell is closed, is dumped to discharge the material upon the large bell. After the small bell has closed, the large bell is dumped to discharge the material into the furnace.

In order to prevent the escape of gas from the furnace to the atmosphere, the large bell should be opened only when the small bell is closed, and the small bell should be opened only when the large bell is closed. At times, the pressure within the furnace is considerably higher than atmospheric pressure. At such times, it is sometimes difficult to cause the large bell to open as the pressure within the furnace may be sufficient to hold the large bell in closed position even though the cable for operating the large bell is slackened.

Means have been provided, as described and claimed in the application of Fox, Whitcomb and Rice filed August 27, 1937, for equalizing the pressure within the space between the two bells with the pressure within the body of the furnace, whereby the opening of the large bell is facilitated. However, in cases where relatively high pressures are involved within the body of the blast furnace, the equalization of pressures referred to is accompanied by difficulty in opening the small bell. In other words, such equalization of the pressures within the space between the bells and the body of the furnace results in a very considerable difference in pressure on the two sides of the small bell, atmospheric pressure being applied to the upper side of the bell, and the high pressure within the furnace being applied on the bottom side of the small bell.

An object of the present invention is to provide simple and efficient means for equalizing the pressure within the space between the two bells of a blast furnace with atmosphere.

A further object is to provide means for accomplishing the dual purpose of (a) equalizing the pressures existing in the space between the two bells of a blast furnace and the body of the blast furnace, and (b) equalizing the pressure between the two bells of the blast furnace and the atmosphere.

As a corollary to the last mentioned object,

a further object of the invention is to provide a unitary means for accomplishing the equalizing functions above referred to.

A further object is to provide a blast furnace construction well adapted to meet the needs of commercial operation.

Referring to the drawing—

Figure 1 is a fragmentary view, partly in section, illustrating the top portion of a blast furnace embodying the principles of the present invention;

Figure 2 is a view on an enlarged scale of a detail of the construction;

Figure 3 is a view in elevation of the structure illustrated in Figure 2; and

Figure 4 illustrates another detail of construction.

The numeral 10 indicates a blast furnace provided with the large bell 11 and the small bell 12. The furnace 10 is provided with the uptake 13 which communicates with the interior of the furnace chamber. A conduit 14 is provided which connects with the space between the large bell 11 and the small bell 12 and leads to the valve structure 15. Said valve structure has connected thereto the conduit 16 which leads to the gas uptake 13. Said valve 15 also has connected thereto the conduit 17 leading to the bleeder valve 18 through which connection may be had to the atmosphere.

The details of the valve structure 15 are illustrated in Figure 2. Said valve structure is provided with two valve seats 19 and 20 which preferably have their operating faces downwardly disposed. Cooperating with said valve seats 19 and 20 are valves 21 and 22, which valves are carried by the swinging bracket 23, secured to a shaft 24 disposed intermediate of the valve seats 19 and 20. It will be noted from an inspection of Figure 2 that when valve 21 is in closed position, valve 22 is open, and, conversely, when valve 22 is in closed position, valve 21 is open. The bracket 23 carrying the valves 21 and 22 is biased to a position with the valve 21 in closed position. For this purpose, a counterweight 25 is provided, carried at the end of a cable 26, which cable is adapted to ride in a section of a pulley 27 fast with the shaft 24. The numeral 28 indicates a cable trained over sheaves and operable by the motive mechanism 29.

As noted above, the conduit 17 is provided with bleeder valve 18. Said bleeder valve includes the cap 30 adapted to seat on the upper extremity of the conduit 17 and adapted to lift upon the attainment of predetermined pressure within the

conduit 17. Said cap 30 is swung upon the lever 31 which is weighted by the counterweight 32. Said counterweight 32 should preferably be adjustable whereby the operator may select the pressure at which the bleeder valve 18 will open.

In operation, control means will be provided for operating the small bell 12 and the large bell 11, means being provided to insure that said bells are not operated simultaneously. Such controls are well known, form no part of the present invention and need not be described herein.

As explained hereinabove, difficulty may be encountered in opening the large bell 11 if the pressure within the furnace is materially higher than the pressure in the space between the bell 11 and the bell 12. In order to equalize these pressures, the valve 21 in the valve structure 15 may be opened by raising the counterweight 25, which movement will result in the closing of the valve 22. Opening of the valve 21 will provide communication between the gas uptake 13 with the space between the two bells, thereby equalizing the pressure on the two sides of the large bell 11. Under these conditions, the large bell may be readily opened.

After the large bell has been opened and closed, the counterweight 25 may be lowered whereby to close the valve 21 and open the valve 22, or, in other words, to close the connection to the gas uptake 13 and to open connection to the bleeder valve 18. The gas pressure in the hopper between the bells is now the top pressure and, in the case of a high pressure furnace, would be too high to permit the ready opening of the small bell 12. This pressure is reduced by the action of the bleeder valve 18.

As explained above, the counterweight 32 may be adjusted to permit the lifting of the cap 30 as soon as the pressure beneath said cap 30 exceeds a pre-set pressure, which is the pressure below that against which the small bell will not satisfactorily operate. As a result, the hopper

pressure in the space between the bells will always be sufficiently low to permit the small bell to operate satisfactorily. By the use of the bleeder valve 18, infiltration of air into the hopper between the bells is prevented when the pressure therein becomes low, due to the operation of the small bell. With this arrangement, the small bell may be operated at any time except when the large bell is open.

Though a preferred embodiment of the present invention has been described in detail, many modifications will appear to those skilled in the art. It is intended to cover all such modifications which fall within the scope of the appended claims.

What is claimed is:

1. In a blast furnace, in combination, a pair of bells arranged in series, a conduit connecting with the space between said bells, a valve structure connected to said conduit, said valve structure having a pair of orifices, valve means for alternatively opening and closing each of said orifices while closing and opening the other of said orifices, respectively, one of said orifices being connected to the atmosphere and the other of said orifices being connected to the interior of the body of said furnace, and valve means biased to closed position for controlling the connection of said first-mentioned orifice to atmosphere.

2. In a blast furnace, in combination, a small bell and a large bell arranged in series, conduit means connected to the space between said bells, valve means adapted alternatively to connect said conduit means to the interior of the body of said furnace and to atmosphere, said valve means being provided with means for insuring that said conduit means is not connected to said furnace body and to atmosphere at the same time, and other valve means biased to closed position for controlling the connection of said mechanism to atmosphere.

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